



Global Product Certification  
EMC-EMF Safety Approvals

**Melbourne**

176 Harrick Road  
Keilor Park, Vic 3042  
Tel: +61 3 9365 1000

**Sydney**

Unit 3/87 Station Road  
Seven Hills, NSW 2147  
Tel: +61 2 9624 2777

Email: [emc-general@emctech.com.au](mailto:emc-general@emctech.com.au)  
Web: [www.emctech.com.au](http://www.emctech.com.au)

## RADIO TEST REPORT

**REPORT NUMBER: M2005023-3**

**TEST STANDARD: FCC PART 15 SUBPART E  
SECTION 15.407  
ISED RSS-247 SECTION 6**

**CLIENT: MINETEC**

**DEVICE: WIFI WASP BRIDGE**

**MODEL: M1011062**

**FCC ID: 2AVQP-M1011050**

**IC: 25823-M1011050**

**DATE OF ISSUE: 16 JANUARY 2021**

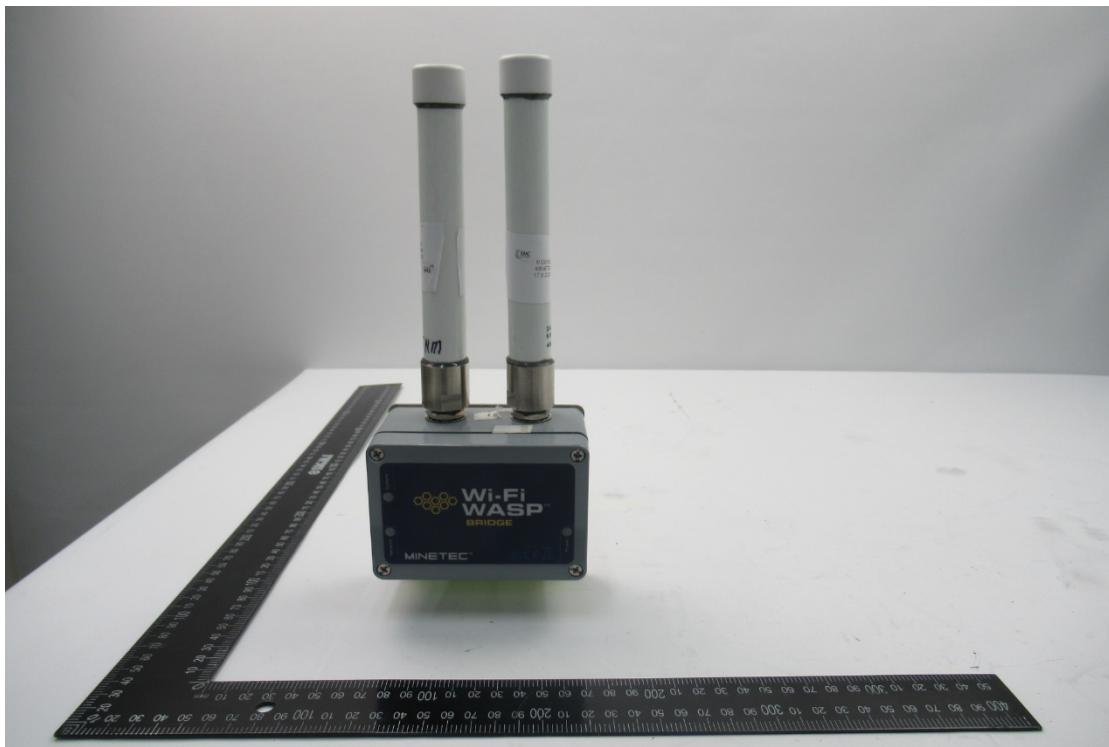
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Accreditation No.5292

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**Equipment Under Test (EUT): WiFi WASP Bridge**

## REVISION TABLE

| Version | Sec/Para Changed | Change Made               | Date       |
|---------|------------------|---------------------------|------------|
| 1       |                  | Initial issue of document | 16/01/2021 |
|         |                  |                           |            |
|         |                  |                           |            |
|         |                  |                           |            |

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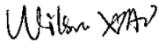
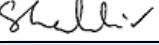


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## RADIO TEST REPORT

### CERTIFICATE OF COMPLIANCE

|                       |  |
|-----------------------|--|
| Device:               | WiFi WASP Bridge   |
| Model:                | M1011062   |
| MAC Address:          | C493000FA332   |
| Manufacturer:         | Minetec  |
| Radio Module:         | 5.8 GHz WASP   |
| FCC ID:               | FCC ID: 2AVQP-M1011050   |
| IC ID:                | IC: 25823-M1011050   |
| Tested for:           | Minetec  |
| Address:              | Unit 2, Wellard Street, Bibra Lake, WA 6163  |
| Phone Number:         | +61 8 92594955   |
| Contact:              | Craig Wroth  |
| Email:                | Craig.wroth@minetec.com.au   |
| Standard:             | FCC Part 15, Subpart E - Unlicensed National Information Infrastructure Devices, Section 15.407 General technical requirements   |
|                       | ISED RSS-247, Issue 2, Section 6 Technical requirements for licence-exempt local network devices and digital transmission systems operating in the 5 GHz band  |
| Result:               | The WiFi WASP Bridge complied with the applicable requirements above standards. Refer to Report M2005023-3 for full details.   |
| Test Date(s):         | 24 November – 4 December, 2020   |
| Issue Date:           | 16 January 2021  |
| Test Engineer(s):     | <br>Wilson Xiao   |
|                       | <br>Ian Ng   |
| Attestation:          | <i>I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.</i>   |
| Authorised Signatory: | <br>Shabbir Ahmed<br>Lead Engineer – RF & Wireless  |
|                       | <b>Issued by:</b> EMC Technologies Pty. Ltd.,<br>176 Harrick Road, Keilor Park, VIC, 3042, Australia.<br><b>Phone:</b> +61 3 9365 1000<br><b>E-mail:</b> <a href="mailto:emc-general@emctech.com.au">emc-general@emctech.com.au</a> <b>Web:</b> <a href="http://www.emctech.com.au">www.emctech.com.au</a> |

## RADIO REPORT FOR CERTIFICATION

### 1 TEST SUMMARY

| Section | Description                                    | FCC           | RSS              | Result(s) |
|---------|--|---------------|------------------|-----------|
| 6.1     | Antenna Requirement                            | §15.203       | §RSS-Gen 6.8     | Complied  |
| 6.2     | Restricted Bands of Operation                  | §15.205       | §RSS-Gen 8.10    | Complied  |
| 6.3     | Radiated emission limits; general requirements | §15.209       | §RSS-Gen 8.9     | Complied  |
| 6.4     | Conducted Limits                               | §15.207       | §RSS-Gen 8.8     | Complied  |
| 6.5     | 6 dB Bandwidth                                 | §15.407(e)    | §RSS-247 6.2.4.1 | Complied  |
| 6.6     | Maximum Conducted Output Power                 | §15.407(a)(3) | §RSS-247 6.2.4.1 | Complied  |
| 6.7     | Power spectral density                         | §15.407(a)(3) | §RSS-247 6.2.4.1 | Complied  |
| 6.8     | Band-Edge Emission Measurements                | §15.407(b)    | §RSS-247 6.2.4.2 | Complied  |
| 6.9     | Spurious Emissions                             | §15.407(b)    | §RSS-247 6.2.4.2 | Complied  |
| 6.10    | Maximum Permissible Exposure                   | §15.407(f)    | §RSS-102         | Complied  |
| 6.11    | Occupied Bandwidth – 99% power                 | §15.215       | §RSS-Gen 6.7     | Complied  |

### 2 TEST FACILITY

#### 2.1 General

EMC Technologies Pty Ltd is accredited by the FCC as a test laboratory able to perform compliance testing for the public. EMC Technologies Pty Ltd has also been designated as a Conformity Assessment Body (CAB) by Australian Communications and Media Authority (ACMA) under the APECTEL MRA and is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) and Certification under Parts 15 and 18 of the FCC Commission's rules – **Registration Number 494713 & Designation number AU0001**.

EMC Technologies Pty Ltd is also an ISED Canada recognized testing laboratory – **ISED company number: 3569B** and **CAB identifier number: AU0001**.

#### 2.2 Test Laboratory/Accreditations

NATA is the Australian National laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Institute (NMI) and an internal quality system similar to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A<sup>2</sup>LA).

All testing in this report has been conducted in accordance with EMC Technologies' scope of NATA accreditation to ISO 17025 for both testing and calibration and ISO 17020 for Inspection – **Accreditation Number 5292**.

The current full scope of accreditation can be found on the NATA website: [www.nata.com.au](http://www.nata.com.au)

### 3 TEST EQUIPMENT CALIBRATION

Measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Keysight Technologies (Australia) Pty Ltd or the National Measurement Institute (NMI) or in-house. All equipment calibration is traceable to Australian national standards at the National Measurements Institute.

| Equipment Type       | Make/Model/Serial Number                             | Last Cal. dd/mm/yyyy | Due Date dd/mm/yyyy | Cal. Interval        |
|----------------------|--|----------------------|---------------------|----------------------|
| Chamber              | Frankonia SAC-3-2 (R-144)                            | 10/08/2020           | 10/08/2023          | 3 Year <sup>*1</sup> |
| EMI Receiver         | R&S ESW26<br>Sn: 101306 (R-143)                      | 05/06/2020           | 05/06/2021          | 1 Year <sup>*2</sup> |
|                      | R&S ESU40<br>Sn: 100392 (R-140)                      | 28/04/2020           | 28/04/2021          | 1 Year <sup>*2</sup> |
| Antennas             | EMCO 6502 Active Loop Antenna<br>Sn: 2021 (A-310)    | 31/08/2020           | 31/08/2022          | 2 Year <sup>*2</sup> |
|                      | SUNOL JB1<br>Sn. A061917 (A-425)                     | 04/09/2019           | 04/09/2021          | 2 Year <sup>*2</sup> |
|                      | EMCO 3115 Horn Antenna<br>Sn: 8908-3282 (A-004)      | 16/01/2019           | 16/01/2022          | 3 Year <sup>*1</sup> |
|                      | ETS-Lindgren Horn Antenna<br>Sn:64179 (A-306)        | 12/06/2018           | 12/06/2021          | 3 Year <sup>*2</sup> |
|                      | ETS-Lindgren Horn Antenna<br>Sn:66032 (A-307)        | 12/06/2018           | 12/06/2021          | 3 Year <sup>*2</sup> |
| Cables <sup>*3</sup> | Huber & Suhner Sucoflex 104A<br>Sn: 503055 (C-457)   | 04/06/2020           | 04/06/2021          | 1 Year <sup>*1</sup> |
|                      | Huber & Suhner Sucoflex 104A<br>Sn: 800448 (C-520)   | 04/06/2020           | 04/06/2021          | 1 Year <sup>*1</sup> |
|                      | Huber & Suhner Sucoflex 102DC<br>Sn: 22538/2 (C-223) | 03/01/2020           | 03/01/2021          | 1 Year <sup>*1</sup> |

Note \*1. Internal NATA calibration.

Note \*2. External NATA / A2LA calibration.

Note \*3. Cables are verified before measurements are taken.

### 4 MEASUREMENT UNCERTAINTY

EMC Technologies has evaluated the equipment and the methods used to perform the emissions testing. The estimated measurement uncertainties for emissions tests shown within this report are as follows:

|                     |                     |         |
|---------------------|---------------------|---------|
| Radiated Emissions: | 9 kHz to 30 MHz     | ±4.1 dB |
|                     | 30 MHz to 300 MHz   | ±5.1 dB |
|                     | 300 MHz to 1000 MHz | ±4.7 dB |
|                     | 1 GHz to 18 GHz     | ±4.6 dB |
|                     | 18 GHz to 40 GHz    | ±4.6 dB |

|                    |         |
|--------------------|---------|
| Peak Output Power: | ±1.5 dB |
|--------------------|---------|

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

#### Application of measurement uncertainty for this report:

The referenced uncertainty standard specifies that determination of compliance shall be based on measurements without taking into account measurement instrumentation uncertainty. However, the measurement uncertainty shall appear in the test report.



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## 5 Device Details

(Information supplied by the Client)

The Minetec Bridge product is designed to perform 5.8 GHz proprietary WASP™ ranging to other WASP devices and to pass the ranging information over a conventional 2.4 GHz Wi-Fi network. The unit can be powered by DC (12-55V) or Power over Ethernet (PoE).

### 5.1 EUT (Transmitter) Details

|                               |  |
|-------------------------------|--|
| <b>Radio:</b>                 | 5.8 GHz WASP   |
| <b>Number of Channels:</b>    | 8  |
| <b>Frequency Band:</b>        | 5725 – 5850 MHz  |
|                               | Channel 1: 5734.375 MHz (Low)  |
|                               | Channel 2: 5749.609 MHz  |
|                               | Channel 3: 5764.843 MHz  |
|                               | Channel 4: 5780.077 MHz  |
| <b>Operating Frequencies:</b> | Channel 5: 5795.311 MHz (Mid)  |
|                               | Channel 6: 5810.545 MHz  |
|                               | Channel 7: 5825.779 MHz  |
|                               | Channel 8: 5841.013 MHz (High)   |
| <b>Nominal Bandwidth:</b>     | 17 MHz ( <i>declared by client</i> )   |
| <b>Modulation:</b>            | QPSK   |
| <b>Antenna:</b>               | Pulse Electronics Omnidirectional (Part No. RO8505NM)<br>Connector: Type N Coaxial |
| <b>Antenna Peak Gain:</b>     | 6 dBi  |

### 5.2 EUT (Host) Details

|                       |  |
|-----------------------|--|
| <b>Test Sample:</b>   | WiFi WASP Bridge   |
| <b>Model:</b>         | M1011062   |
| <b>MAC Address:</b>   | C493000FA332   |
| <b>Supply Rating:</b> | 12-55V DC via AC/DC adapter or Power over Ethernet (PoE) |
| <b>Manufacturer:</b>  | Minetec  |

### 5.3 Test Configuration

Testing was performed with the transceiver set to transmit continuously (Maximum Duty Cycle) at Low channel (5734.375 MHz), Mid Channel (5795.311 MHz) and High Channel (5841.013 MHz).

### 5.4 Modifications

No modifications were required to achieve compliance.

### 5.5 Deviations from the Standard

Note any deviations to the standard

## 6 RESULTS

### 6.1 §15.203 / §RSS-Gen 6.8 Antenna Requirement

The WiFi WASP Bridge has a Type N antenna port and incorporates the following external antenna only:

**Antenna Type:** Pulse Larson R08505NM

**Antenna gain:** 6.0 dBi

**Connector:** Type N Male

**Antenna port to antenna connection:** Type N Female

The above antenna will be installed by professional installers who have been trained by Minetec. Such installation shall be accomplished using only antennas and installation materials provided by Minetec. Said installation will preclude any unauthorized switching of antennas.

### 6.2 §15.205 / §RSS-Gen 8.10 Restricted Bands of Operation

The provisions of the §15.205 restricted bands of operation and §15.209 radiated emissions limits have been met, refer to section 6.9.

### 6.3 §15.209 / §RSS-Gen 8.9 Radiated emission limits; general requirements

The provisions of the §15.205 restricted bands of operation and §15.209 radiated emissions limits have been met, refer to section 6.9.

### 6.4 §15.207 / §RSS-Gen 8.8 Conducted Limits

#### 6.4.1 Test Procedure

The arrangement specified in ANSI C63.10: 2013 was adhered to for the conducted EMI measurements. The EUT was placed in the RF screened enclosure and a CISPR EMI Receiver as defined in ANSI C63.2: 2009 was used to perform the measurements.

The specified 0.15 MHz to 30 MHz frequency range was sub-divided into sub-ranges to ensure that all short duration peaks were captured. For each of the sub-ranges, the EMI receiver was set to continuous scan with the Peak detector set to Max-Hold mode. The Quasi-Peak detector and the Average detector were then invoked to measure the actual Quasi-Peak and Average level of the most significant peaks, which were detected.

#### 6.4.2 Limits

The limit applied was in accordance to the conducted limits defined in §15.207 / RSS-Gen 8.8.

### 6.4.3 Results

M2005023  
Normal AC Adapter  
120V 60Hz  
Low Channel

Limit1: FCC207\_QP  
Limit2: FCC207\_AV  
FCC Part 15.207 Conducted Quasi-Peak Limit  
FCC Part 15.207 Conducted Average Limit

Trace 2: Active Line  
Trace 3: Neutral Line

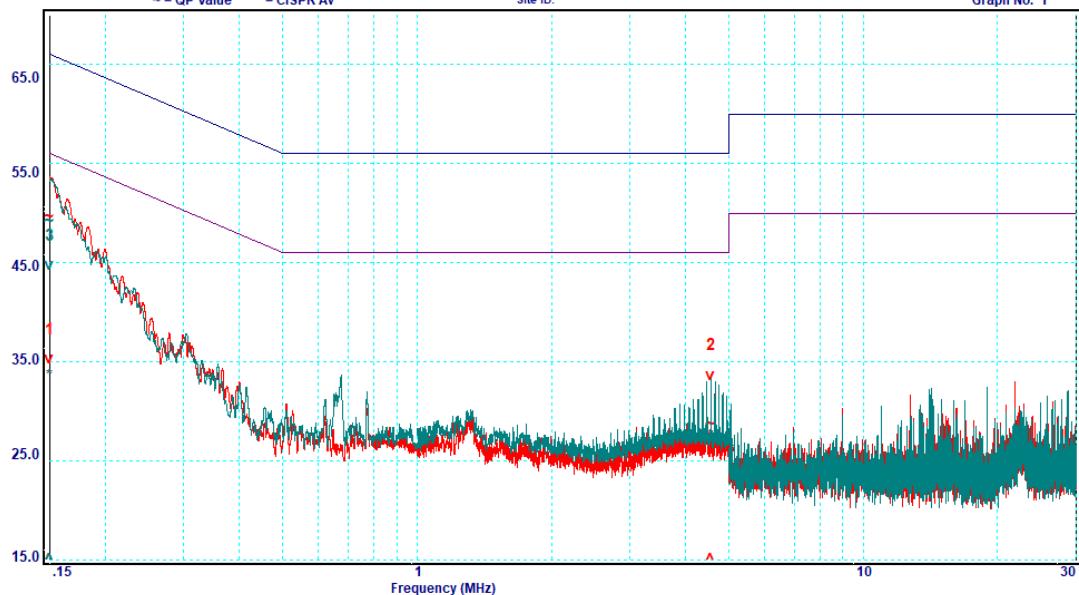
Job No: M2005023

Conducted Emissions (dBuV)  
~ = QP Value \* = CISPR Av

Test Date: 03/12/2020  
Test Officer: Plot date: 12-07-2020 13:33:13  
t.0771121 c1:C3990121 c2:NONE p:NONE a:L0180121

WinstRS:32.8-Wplt:164.0-Rx:R&S,ESR-7,1316.3003K

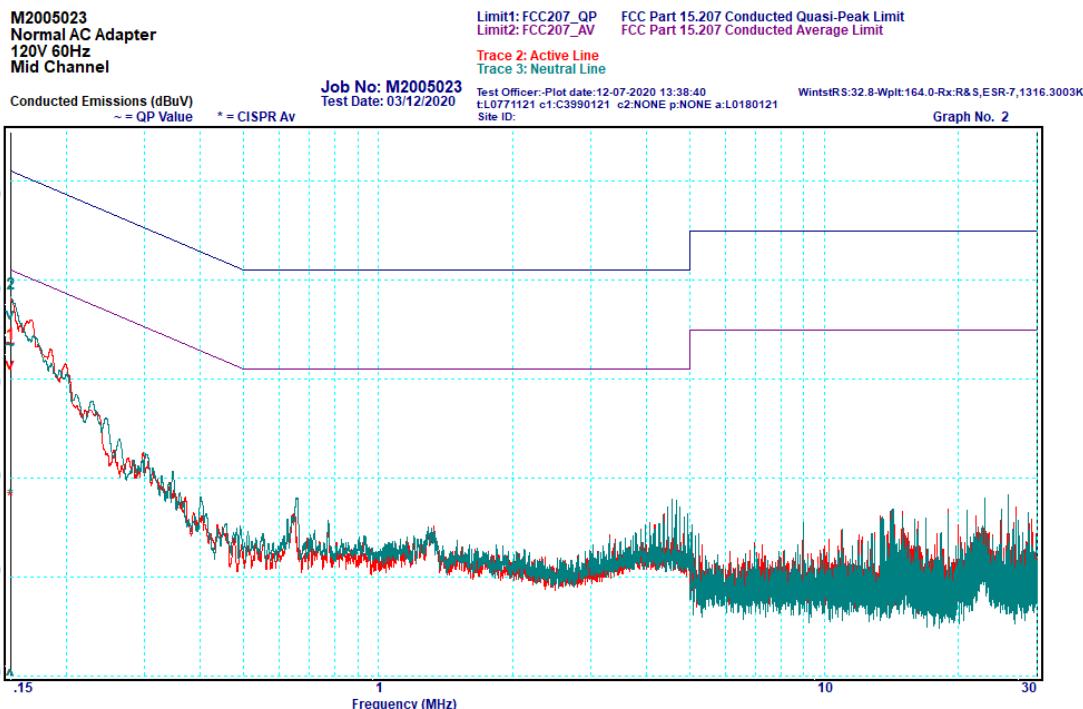
Graph No. 1



Graph 6-1: AC Conducted Emissions, 150 kHz – 30 MHz, Low Channel

Table 6-1: AC Conducted Emissions, 150 kHz – 30 MHz, Low Channel

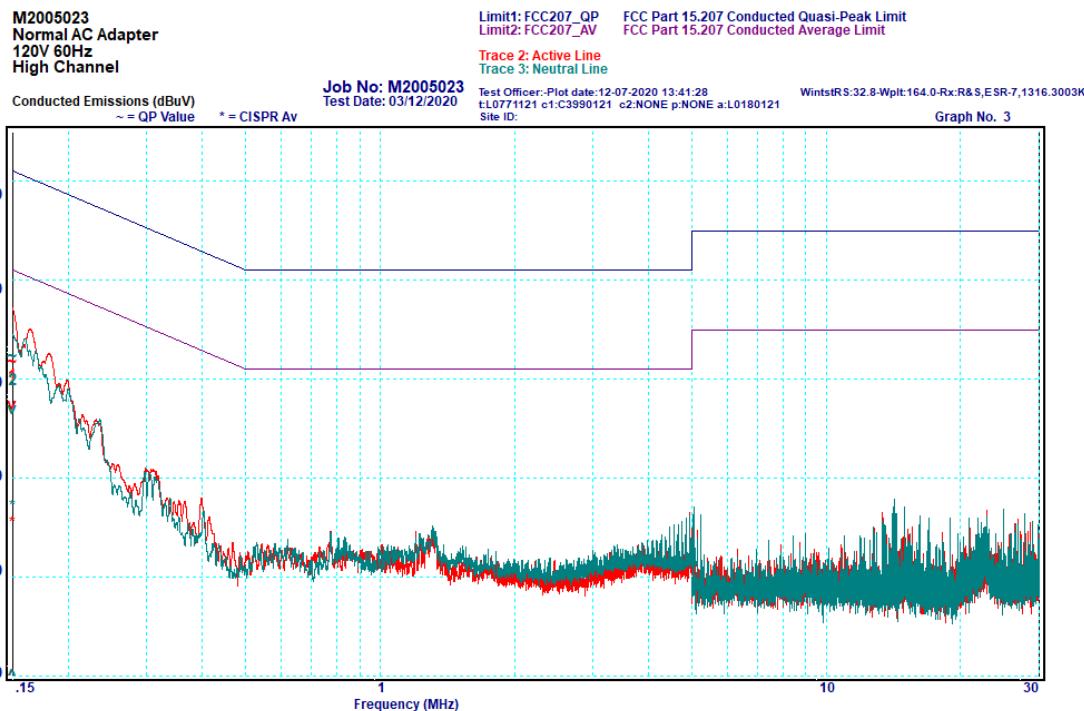
| Peak | Frequency [MHz] | Line    | Quasi-Peak         |                    |                            | Average            |                    |                            |
|------|-----------------|---------|--------------------|--------------------|----------------------------|--------------------|--------------------|----------------------------|
|      |                 |         | Level [dB $\mu$ V] | Limit [dB $\mu$ V] | $\Delta$ Limit [ $\pm$ dB] | Level [dB $\mu$ V] | Limit [dB $\mu$ V] | $\Delta$ Limit [ $\pm$ dB] |
| 1    | 0.15            | Active  | 49.6               | 66                 | -16.4                      | 33.5               | 56                 | -22.5                      |
| 2    | 4.557           | Active  | 28.6               | 56                 | -27.4                      | 27.4               | 46                 | -18.6                      |
| 3    | 0.15            | Neutral | 49.1               | 66                 | -16.9                      | 33.5               | 56                 | -22.5                      |



Graph 6-2: AC Conducted Emissions, 150 kHz – 30 MHz, Mid Channel

Table 6-2: AC Conducted Emissions, 150 kHz – 30 MHz, Mid Channel

| Peak | Frequency [MHz] | Line    | Quasi-Peak         |                    |                            | Average            |                    |                            |
|------|-----------------|---------|--------------------|--------------------|----------------------------|--------------------|--------------------|----------------------------|
|      |                 |         | Level [dB $\mu$ V] | Limit [dB $\mu$ V] | $\Delta$ Limit [ $\pm$ dB] | Level [dB $\mu$ V] | Limit [dB $\mu$ V] | $\Delta$ Limit [ $\pm$ dB] |
| 1    | 0.15            | Active  | 48.4               | 66                 | -17.6                      | 33                 | 56                 | -23                        |
| 2    | 0.15            | Neutral | 48.4               | 66                 | -17.6                      | 33.2               | 56                 | -22.8                      |



Graph 6-3: AC Conducted Emissions, 150 kHz – 30 MHz, High Channel

Table 6-3: AC Conducted Emissions, 150 kHz – 30 MHz, High Channel

| Peak | Frequency [MHz] | Line    | Quasi-Peak         |                    |                            | Average            |                    |                            |
|------|-----------------|---------|--------------------|--------------------|----------------------------|--------------------|--------------------|----------------------------|
|      |                 |         | Level [dB $\mu$ V] | Limit [dB $\mu$ V] | $\Delta$ Limit [ $\pm$ dB] | Level [dB $\mu$ V] | Limit [dB $\mu$ V] | $\Delta$ Limit [ $\pm$ dB] |
| 1    | 0.15            | Active  | 46.7               | 66                 | -19.3                      | 30.4               | 56                 | -25.6                      |
| 2    | 0.15            | Neutral | 47.3               | 66                 | -18.7                      | 32                 | 56                 | -24                        |



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## 6.5 §15.407(e)/ §RSS-247 6.2.4.1 – 6 dB bandwidth

### 6.5.1 Test Procedure

The tests were performed in accordance with KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section C Bandwidth Measurement.

The 6 dB bandwidth was measured while the device was transmitting with typical modulation applied. The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised when measuring the bandwidth.

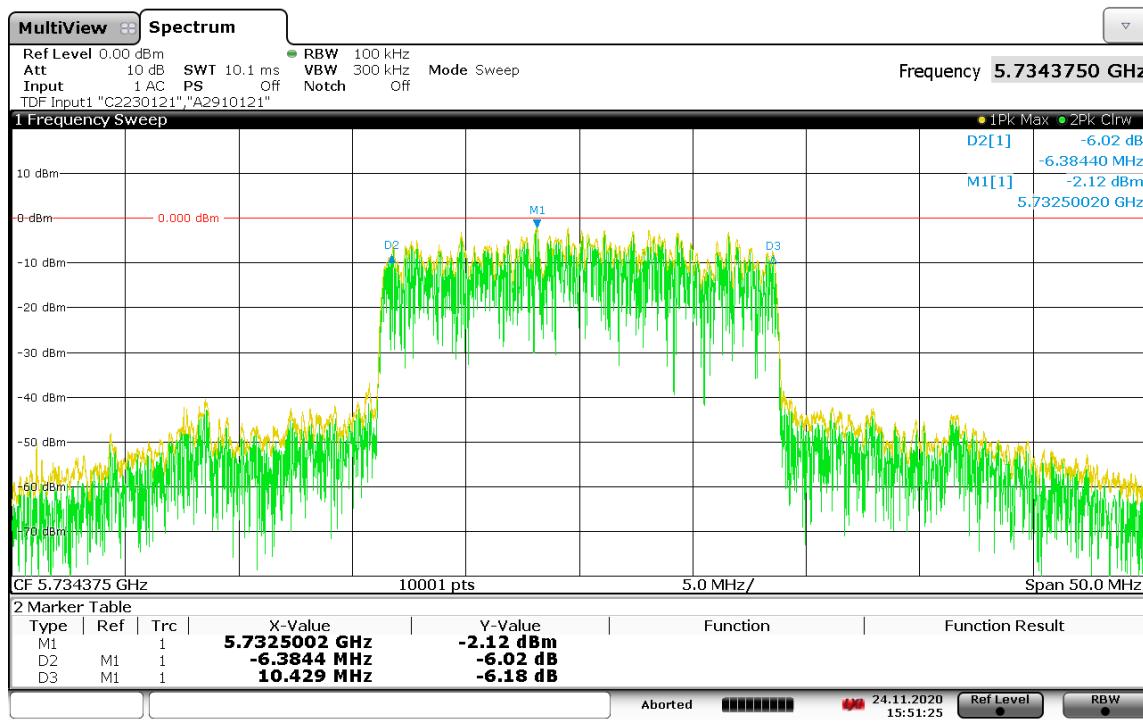
### 6.5.2 Limits

Within the 5.725 – 5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

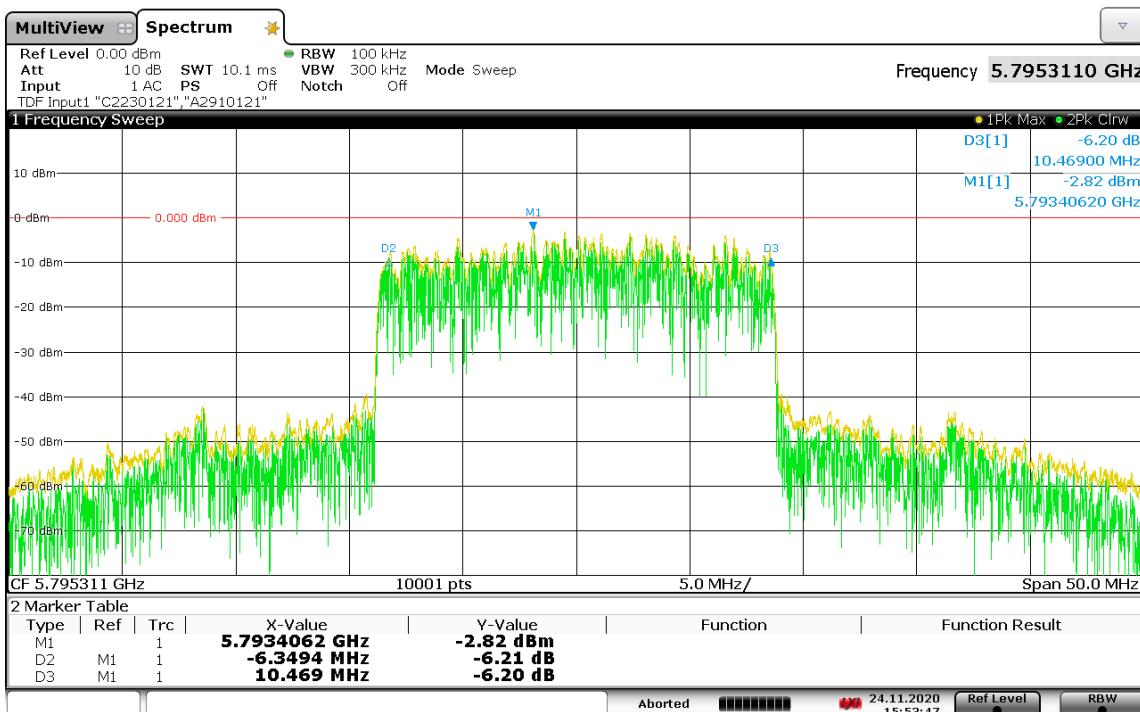
### 6.5.3 Results

Table 6-4: 6dB Bandwidth

| Freq. [MHz] | 6 dB Bandwidth [kHz] | Limit [kHz] | Results  |
|-------------|----------------------|-------------|----------|
| 5734.375    | 16800                | >= 500      | Complied |
| 5795.311    | 16800                | >= 500      | Complied |
| 5841.013    | 16790                | >= 500      | Complied |



Graph 6-4: 6 dB bandwidth, 5734.375 MHz (Low channel)



Graph 6-5: 6 dB bandwidth, 5795.311 MHz (Mid Channel)



Graph 6-6: 6 dB bandwidth, 5841.013 MHz (High Channel)

## 6.6 §15.407(a)(3) / §RSS-247 6.2.4.1 Maximum Conducted Output Power

### 6.6.1 Test Procedure

The tests were performed in accordance with KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section E Maximum Conducted Output Power – Method SA-2

Duty cycle and 26 dB Emission Bandwidth were measured to performed the maximum Conducted Output Power.

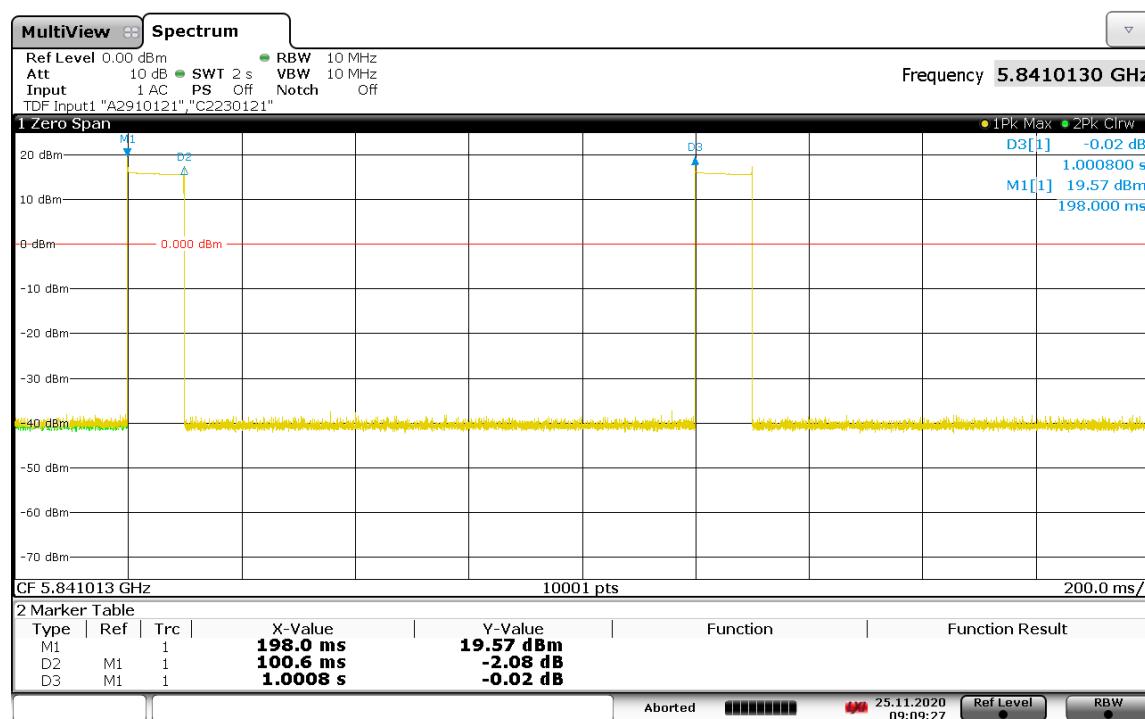
### 6.6.2 Limits

The maximum conducted output power at 5725 – 5850 MHz shall not exceed 1W.

### 6.6.3 Results

Table 6-5: Duty cycle Correction Factor

| Freq. [MHz] | Single Pulse [ms] | Period [ms] | Duty Cycle | Correction Factor |
|-------------|-------------------|-------------|------------|-------------------|
| 58410.13    | 100.6             | 1000.8      | 10%        | 10                |



Graph 6-7: Duty Cycle

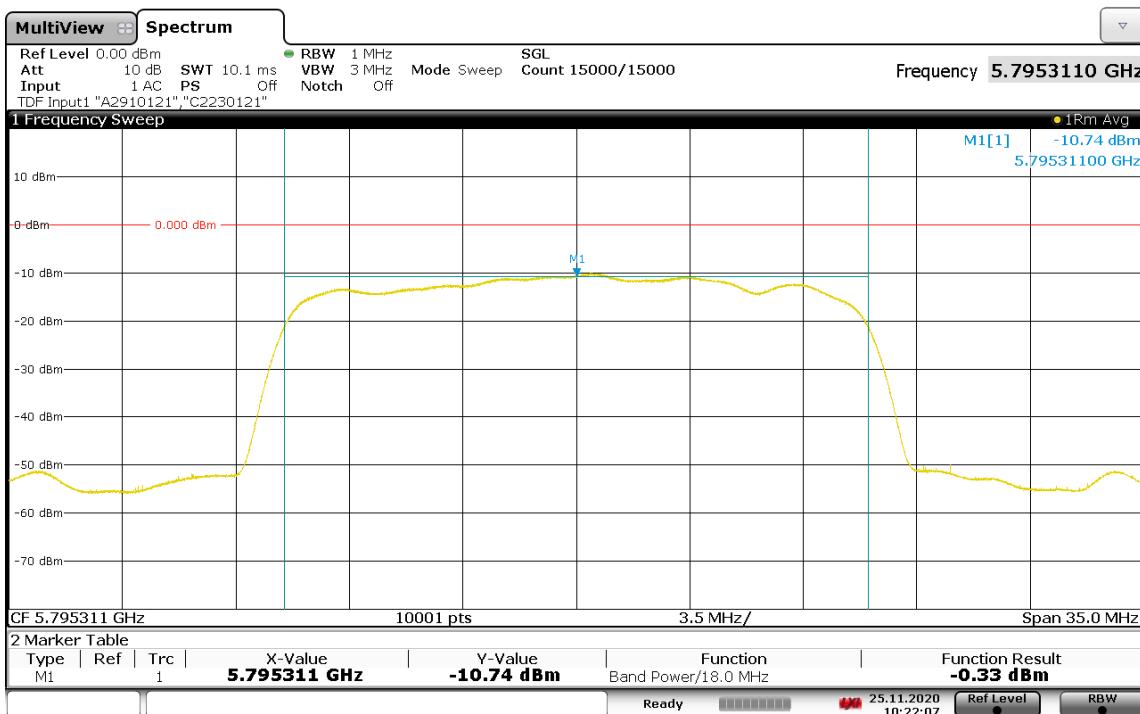
Table 6-6: Maximum Conducted Output Power

| Freq.<br>[MHz] | Measured<br>Conducted Power<br>(dBm) | Correction<br>Factor | Maximum Conducted<br>Output Power |        | Limit<br>(W) | Results  |
|----------------|--------------------------------------|----------------------|-----------------------------------|--------|--------------|----------|
|                |                                      |                      | (dBm)                             | (W)    |              |          |
| 5734.375       | 0.97                                 | 10                   | 10.97                             | 0.0125 | 1            | Complied |
| 5795.311       | -0.33                                | 10                   | 9.67                              | 0.0092 | 1            | Complied |
| 5841.013       | 0.52                                 | 10                   | 10.52                             | 0.0112 | 1            | Complied |



10:29:50 25.11.2020

Graph 6-8: Measured Conducted Power, Low Channel



Graph 6-9: Measured Conducted Power, Mid Channel



Graph 6-10: Measured Conducted Power, High Channel

## 6.7 §15.407(a)(3) / §RSS-247 6.2.4.1 Maximum Power Spectral Density

### 6.7.1 Test Procedure

The tests were performed in accordance with KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section F Maximum Power Spectral Density.

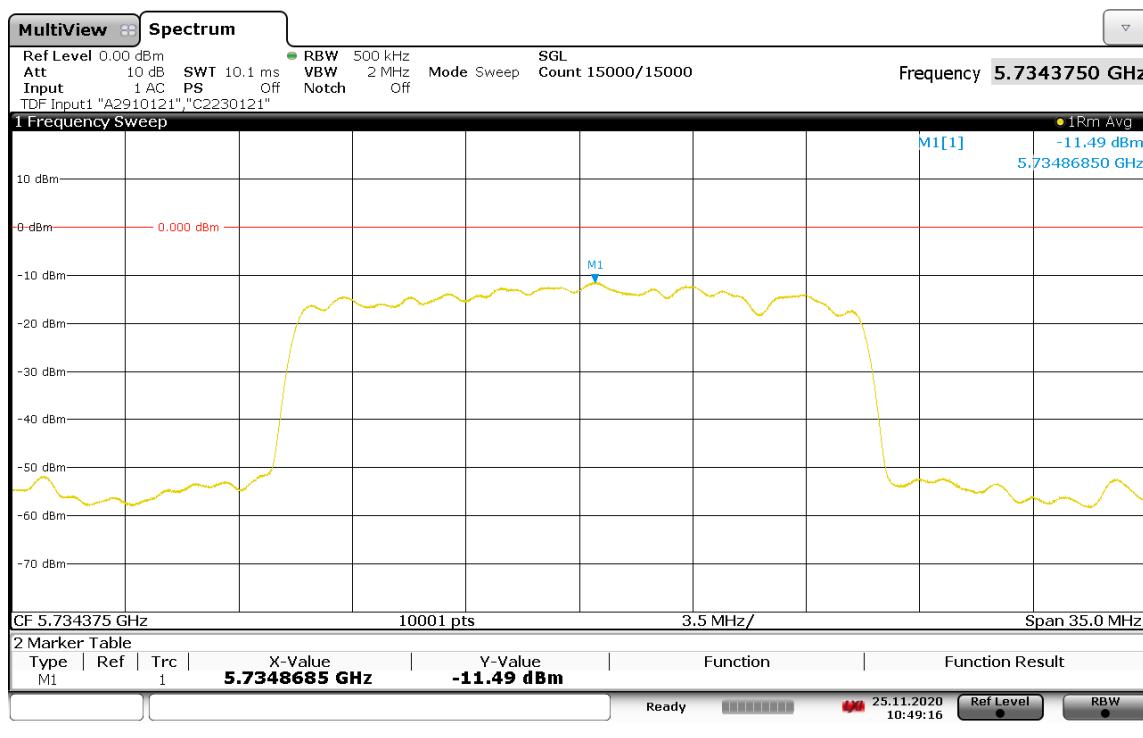
### 6.7.2 Limits

Within the 5.725 – 5.85 GHz band, the maximum power spectral density shall not exceed 30 dBm.

### 6.7.3 Results

Table 6-7: Maximum Power Spectral Density

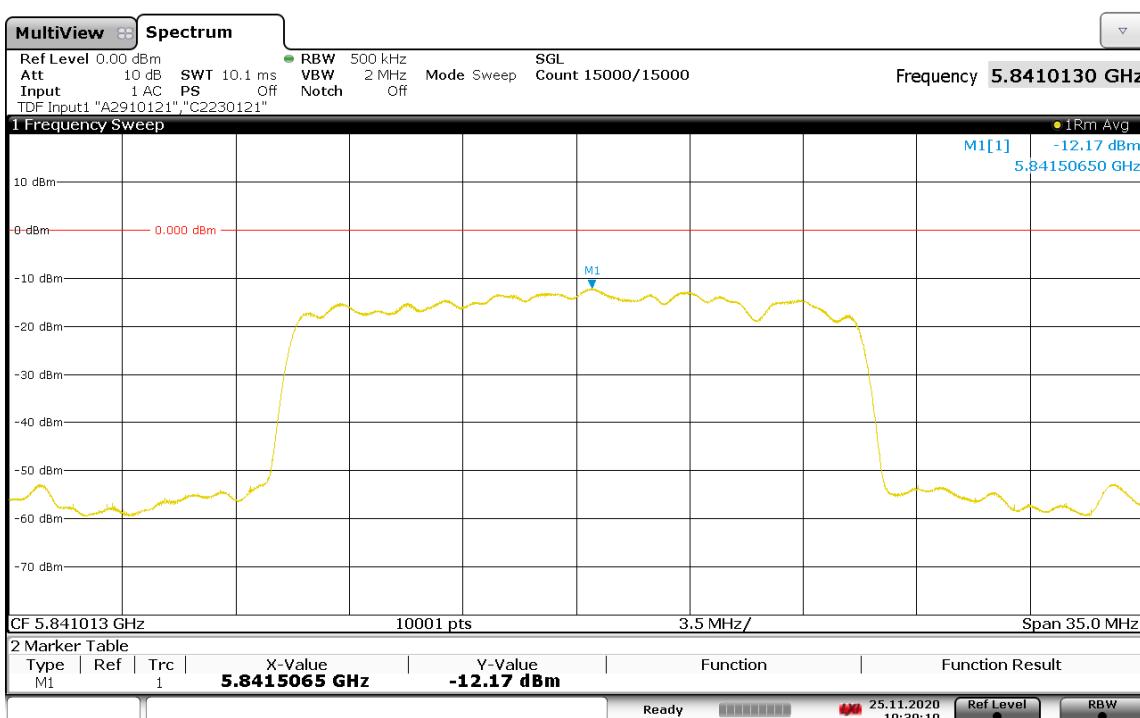
| Freq. [MHz] | Measured Power Spectral Density (dBm) | Correction Factor | Maximum Power Spectral Density (dBm) | Limit (dBm) | Results  |
|-------------|---------------------------------------|-------------------|--------------------------------------|-------------|----------|
| 5734.375    | -11.49                                | 10                | -1.49                                | 30          | Complied |
| 5795.311    | -12.84                                | 10                | -2.84                                | 30          | Complied |
| 5841.013    | -12.17                                | 10                | -2.17                                | 30          | Complied |



Graph 6-11: Measured Power Spectral Density, Low Channel



Graph 6-12: Measured Power Spectral Density, Mid Channel



Graph 6-13: Measured Power Spectral Density, High Channel

## 6.8 §15.407(b) / §RSS-247 6.2.4.2 Band-Edge Emission Measurements

### 6.8.1 Test Procedure

The tests were performed in accordance with KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section G Unwanted Emission Measurement.

EUT was investigated on all three axes (x, y, and z). Measurements on the worst axis (x-axis) are presented below.

EUT was set at a height of 1.5 m above the ground for measurement and measurement distance was 3 meters.

### 6.8.2 Limits

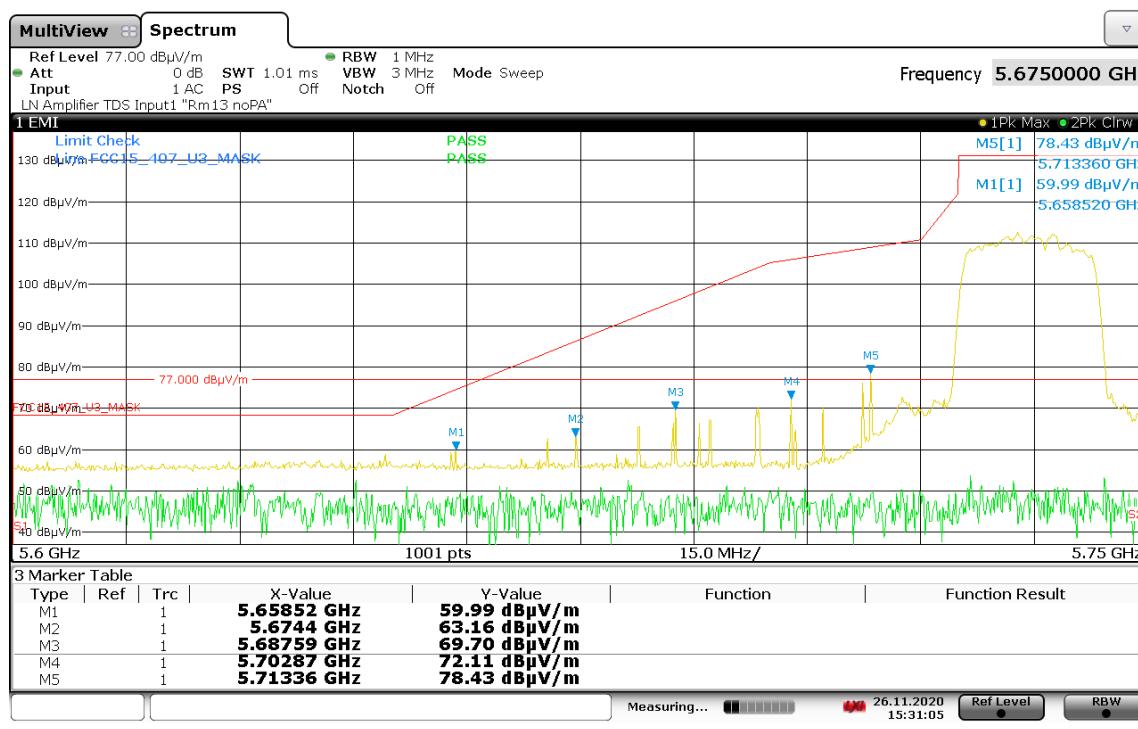
The limit applied is in accordance with the emissions limit defined in §15.407(b)(4)(i).

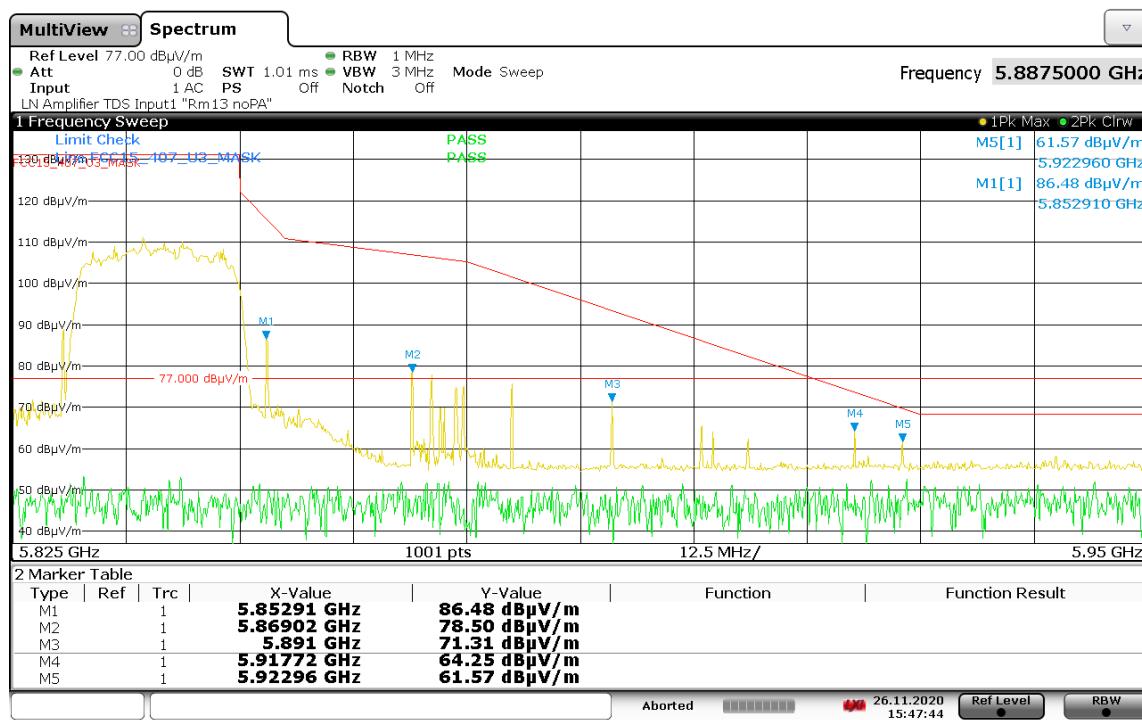
All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

| E.I.R.P |  |
|---------|--|
| [dBm]   | Equivalent to field strength @3m<br>[dB $\mu$ V/m] |
| -27     | 68.23  |
| 10      | 105.23   |
| 15.6    | 110.83   |
| 27      | 122.23   |

### 6.8.3 Results

All emissions measured complied with the Band-Edge requirements of the standard.





Graph 6-15: Band-Edge Emission, Upper edge

## 6.9 §15.407(b) / §RSS-247 6.2.4.2 Radiated Spurious Emissions

### 6.9.1 Test procedure

Radiated out-of-band/spurious emissions measurements were performed in a semi-anechoic chamber compliant with ANSI C63.4: 2014.

The test frequency range was sub-divided into smaller bands with the defined resolution bandwidths to permit reliable display and identification of emissions.

| Frequency range [MHz] | Measurement Bandwidth [kHz] | Measurement Distance [m] | Antenna                         |
|-----------------------|-----------------------------|--------------------------|---------------------------------|
| 0.009 to 0.150        | 0.2                         | 3                        |                                 |
| 0.150 to 30           | 9                           | 3                        | 0.6 metre loop antenna          |
| 30 to 1000            | 120                         | 3                        | Biconilog hybrid                |
| 1000 to 18 000        | 1000                        | 3                        | Standard gain or broadband horn |
| 18 000 to 40 000      | 1000                        | 1                        |                                 |

EUT was set at a height of 0.8 m for measurements below 1000 MHz and set at a height of 1.5 m for measurements above 1000 MHz.

The sample was slowly rotated with the spectrum analyser set to Max-Hold. This was performed for at least two antenna heights. When an emission was located, it was positively identified and its maximum level found by rotating the automated turntable and by varying the antenna height. For below 1000 MHz the emissions were measured with a Quasi-Peak detector, and for above 1000 MHz the emissions were measured with Peak and Average detectors.

The measurement data for each frequency range was corrected for cable losses, antenna factors and preamplifier gain. This process was performed for both horizontal and vertical polarisations of the measurement antenna.

EUT was investigated on all three axes (x, y, and z). Measurements on the worst axis (x-axis) are presented below.

### 6.9.2 Limits

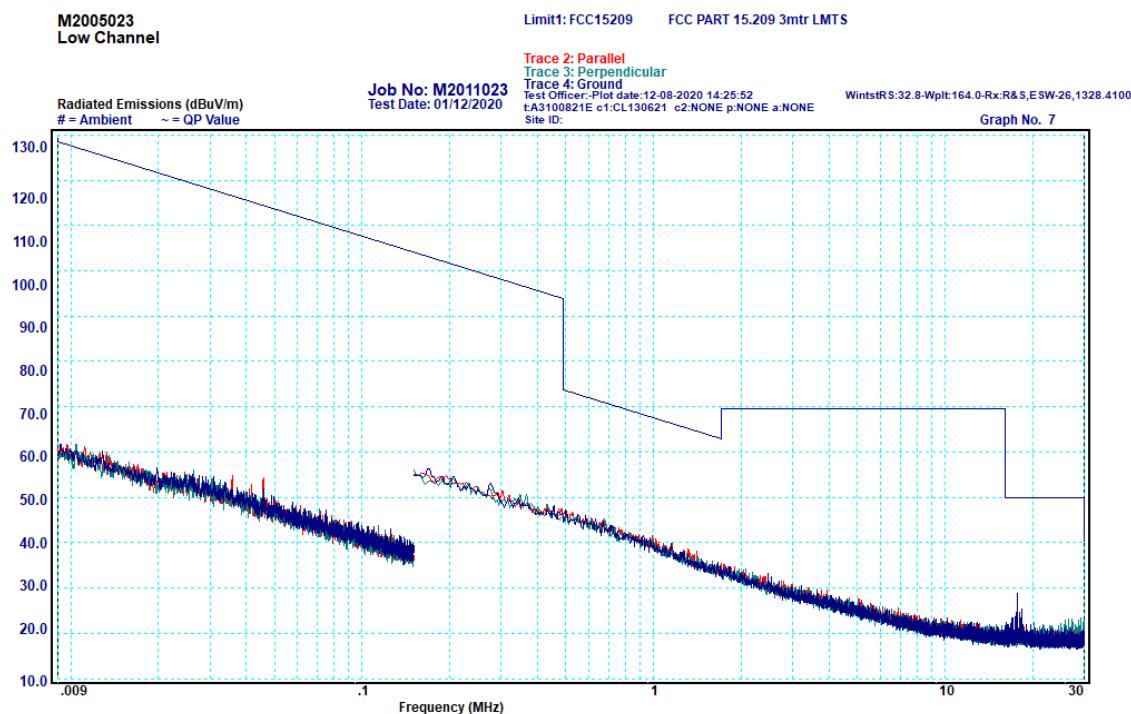
The limit applied is in accordance with the emissions limit defined in §15.407(b)(4).

All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

The general limits of §15.209 applies for unwanted emissions below 1 GHz and the provision of §15.205 also applies under this section.

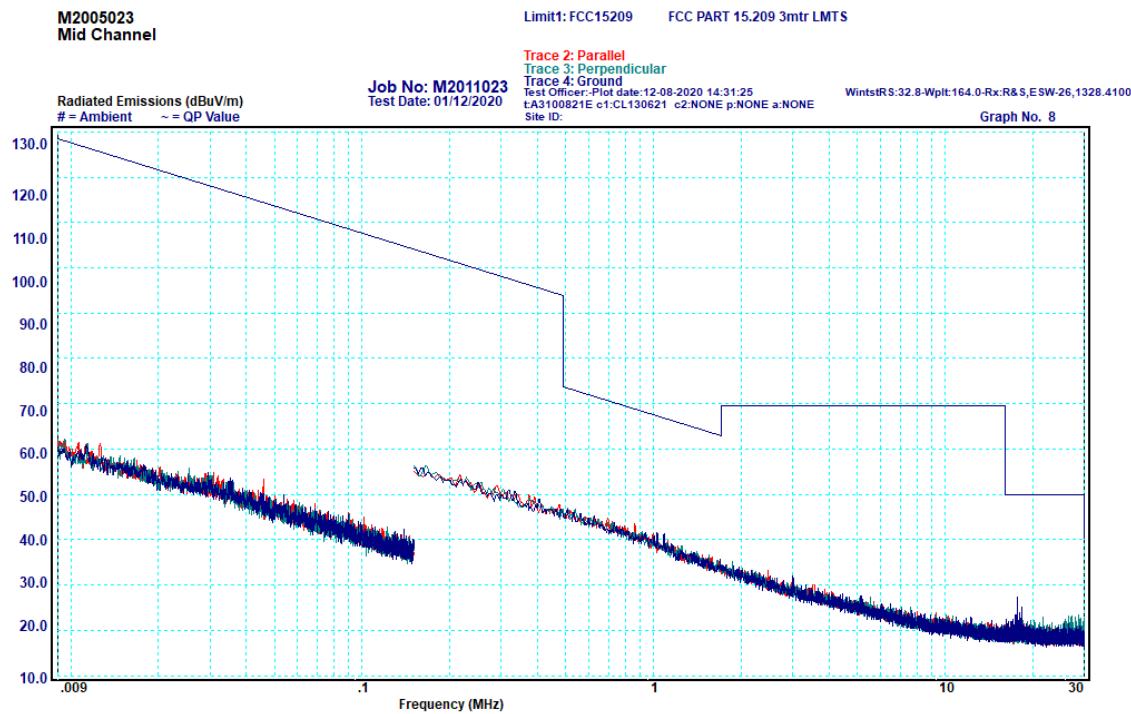
### 6.9.3 Transmitter Spurious Emissions: 9 kHz to 30 MHz

All emissions measured in the frequency band 9kHz - 30MHz complied with the requirements of the standard.



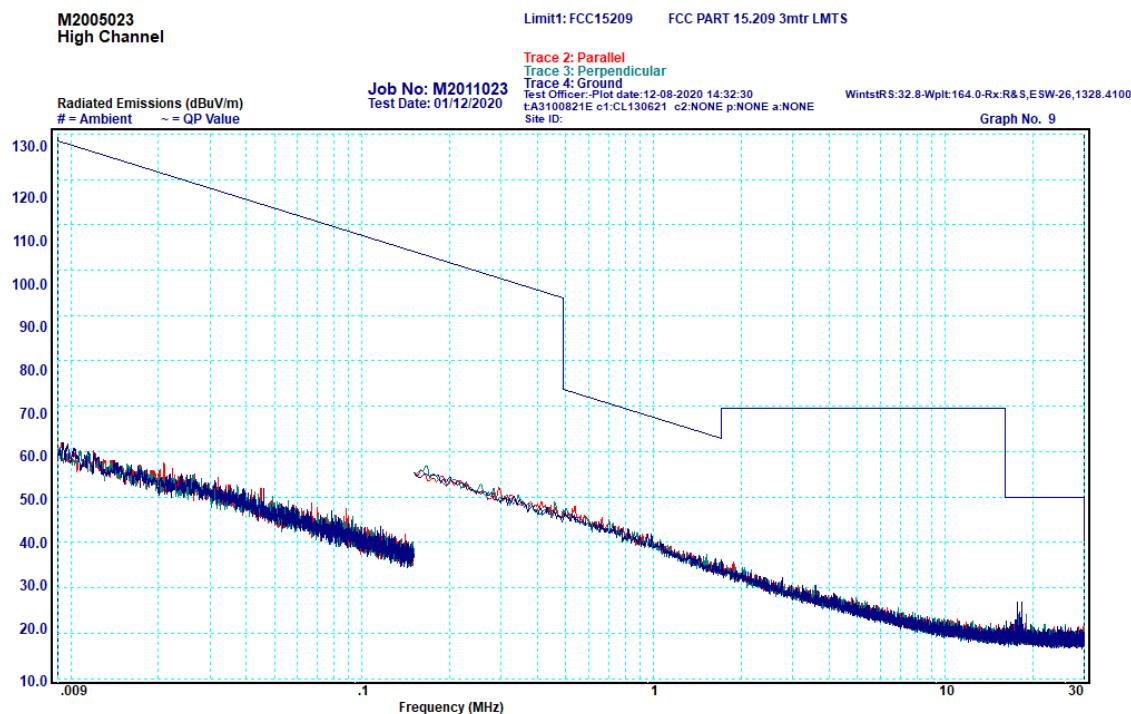
Graph 6-16: Transmitter Spurious Emissions, 9kHz – 30 MHz, Low Channel

No peaks were measured within 10 dB of the limit.



Graph 6-17: Transmitter Spurious Emissions, 9kHz – 30 MHz, Mid Channel

No peaks were measured within 10 dB of the limit.

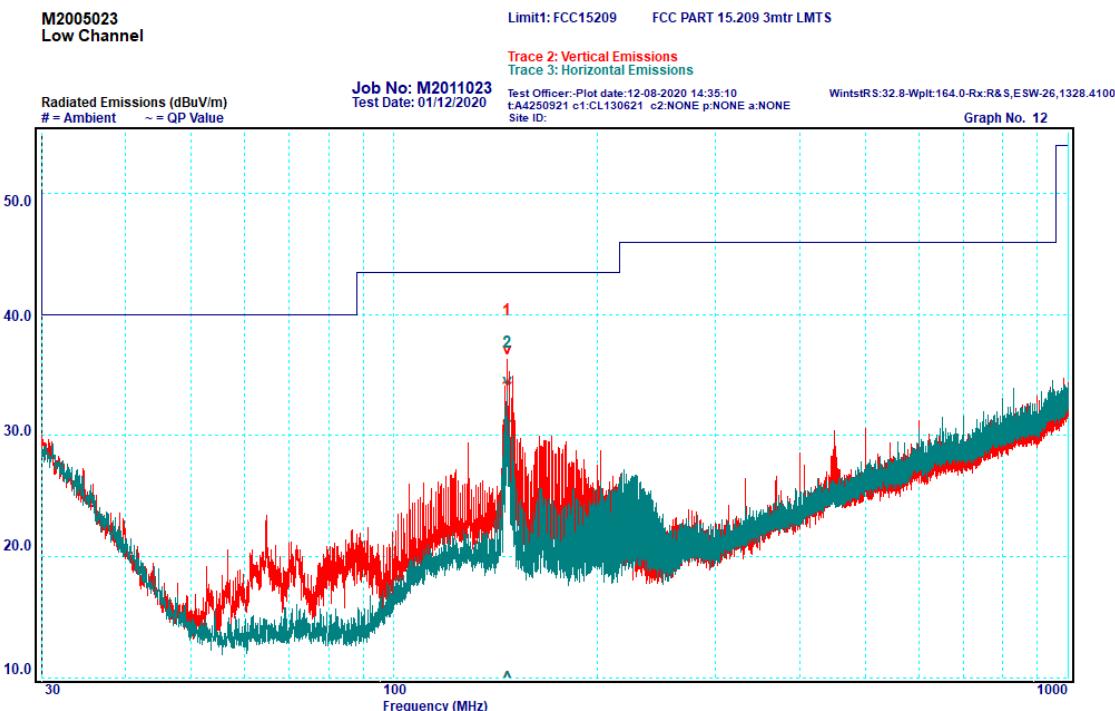


Graph 6-18: Transmitter Spurious Emissions, 9kHz – 30 MHz, High Channel

No peaks were measured within 10 dB of the limit.

#### 6.9.4 Transmitter Spurious Emissions: 30 - 1000 MHz

All emissions measured in the frequency band 30 – 1000 MHz complied with the requirements of the standard.



Graph 6-19: Transmitter Spurious Emissions, 30 – 1000 MHz, Low Channel

Table 6-8: Transmitter Spurious Emissions, 30 – 1000 MHz, Low Channel

| Peak | Frequency [MHz] | Polarisation | Peak                 |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1    | 147.31          | Vertical     | 34.3                 | 43.5                 | -9.2        |
| 2    | 147.3           | Horizontal   | 31.2                 | 43.5                 | -12.3       |

M2005023  
Mid Channel

Limit1: FCC15209 FCC PART 15.209 3mtr LMTS

Trace 2: Vertical Emissions

Trace 3: Horizontal Emissions

Job No: M2011023

Test Date: 01/12/2020

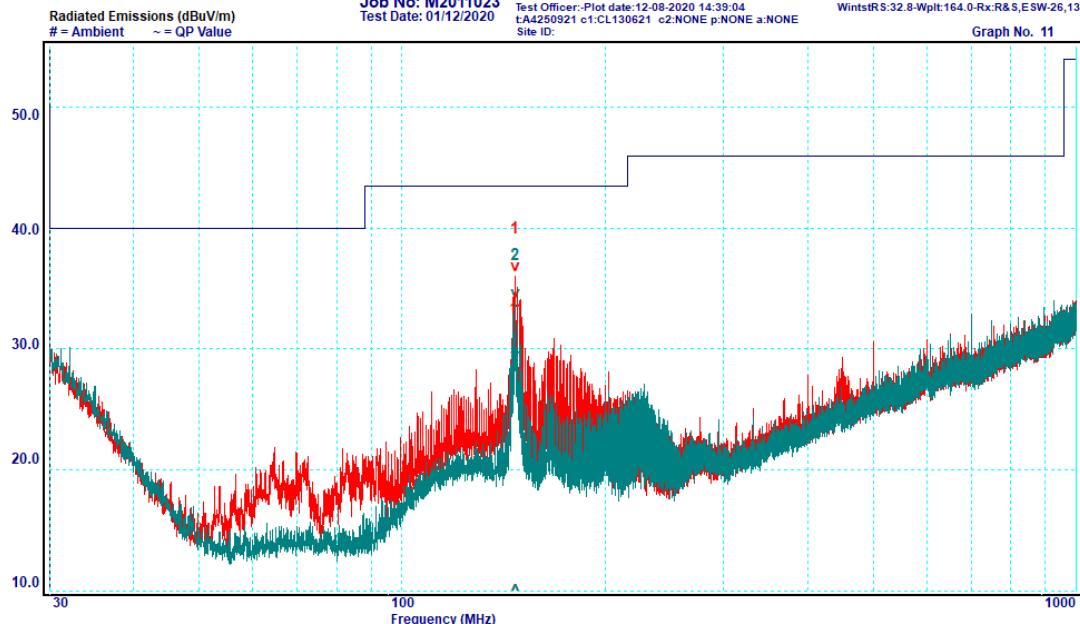
Test Officer: Plot date: 12-08-2020 14:39:04

t4250921 c1:CL130621 c2:NONE p:NONE a:NONE

WinstRS:32.8-Wplt:164.0-Rx:R&amp;S,ESW-26,1328.4100

Site ID:

Graph No. 11



Graph 6-20: Transmitter Spurious Emissions, 30 – 1000 MHz, Mid Channel

Table 6-9: Transmitter Spurious Emissions, 30 – 1000 MHz, Mid Channel

| Peak | Frequency [MHz] | Polarisation | Peak                 |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1    | 147.26          | Vertical     | 33.6                 | 43.5                 | -9.9        |
| 2    | 147.23          | Horizontal   | 29.7                 | 43.5                 | -13.8       |



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M2005023  
High Channel

Limit1: FCC15209 FCC PART 15.209 3mtr LMTS

Trace 2: Vertical Emissions

Trace 3: Horizontal Emissions

Job No: M2011023

Test Date: 01/12/2020

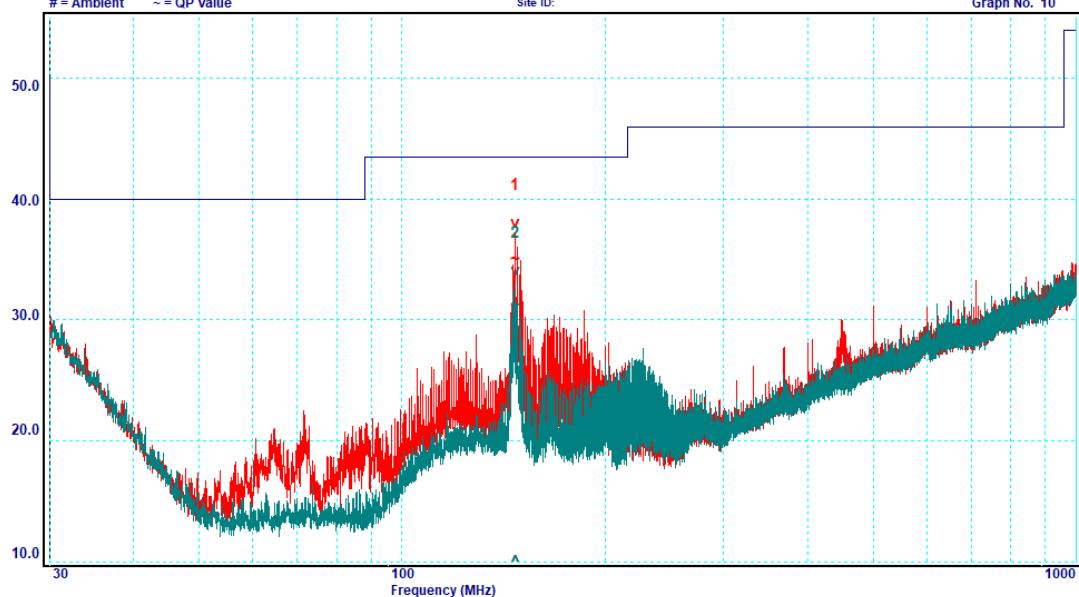
Test Officer: Plot date: 12-08-2020 14:41:10

t4250921 c1:CL130621 c2:NONE p:NONE a:NONE

WinstRS:32.8-Wpt:164.0-Rx:R&S,ESW-26,1328.4100

Site ID:

Graph No. 10



Graph 6-21: Transmitter Spurious Emissions, 30 – 1000 MHz, High Channel

Table 6-10: Transmitter Spurious Emissions, 30 – 1000 MHz, High Channel

| Peak | Frequency [MHz] | Polarisation | Peak                 |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1    | 147.32          | Vertical     | 35                   | 43.5                 | -8.5        |
| 2    | 147.29          | Horizontal   | 31.2                 | 43.5                 | -12.3       |

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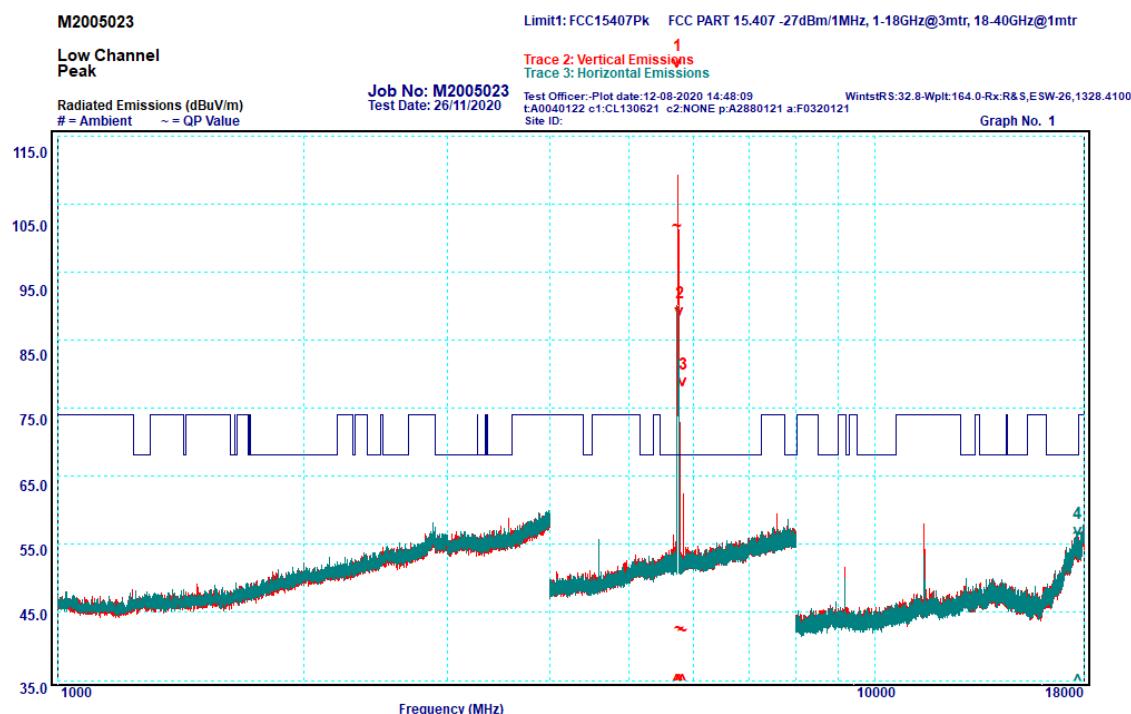


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### 6.9.5 Transmitter Spurious Emissions: 1 - 18 GHz

All emissions measured in the frequency band 1 – 18 GHz complied with the requirements of the standard.

#### Peak Measurements:

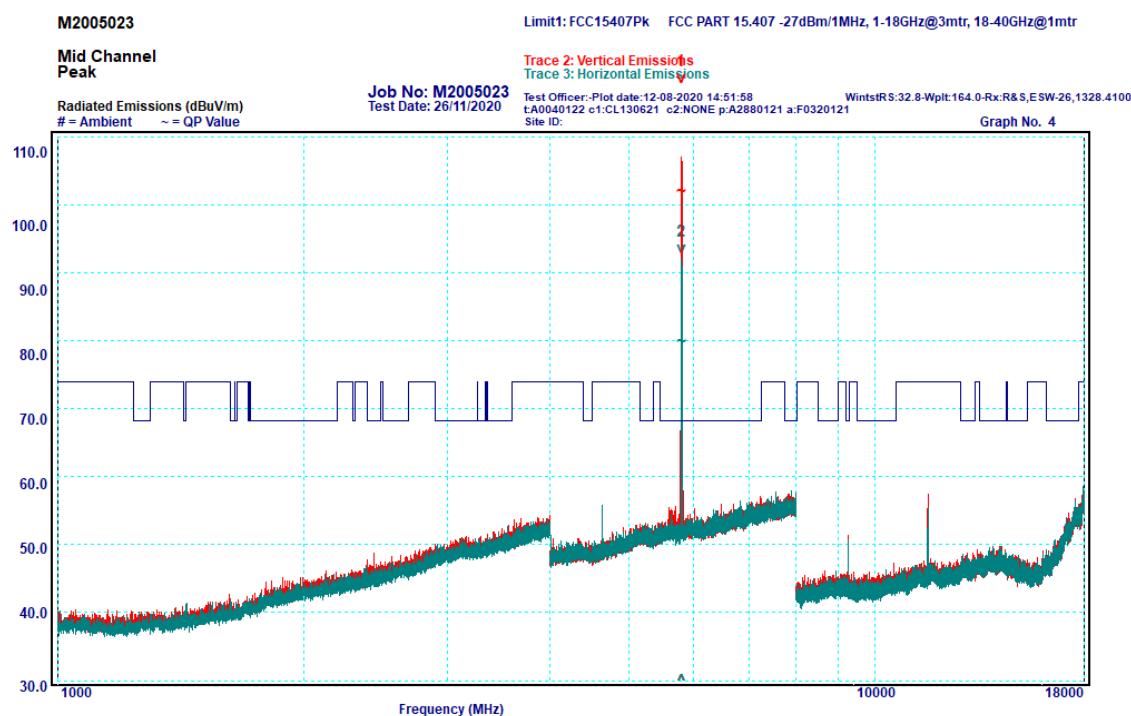


Graph 6-22: Transmitter Spurious Emissions, 1 – 18 GHz, Low Channel, Peak

Table 6-11: Transmitter Spurious Emissions, 1 – 18 GHz, Low Channel, Peak

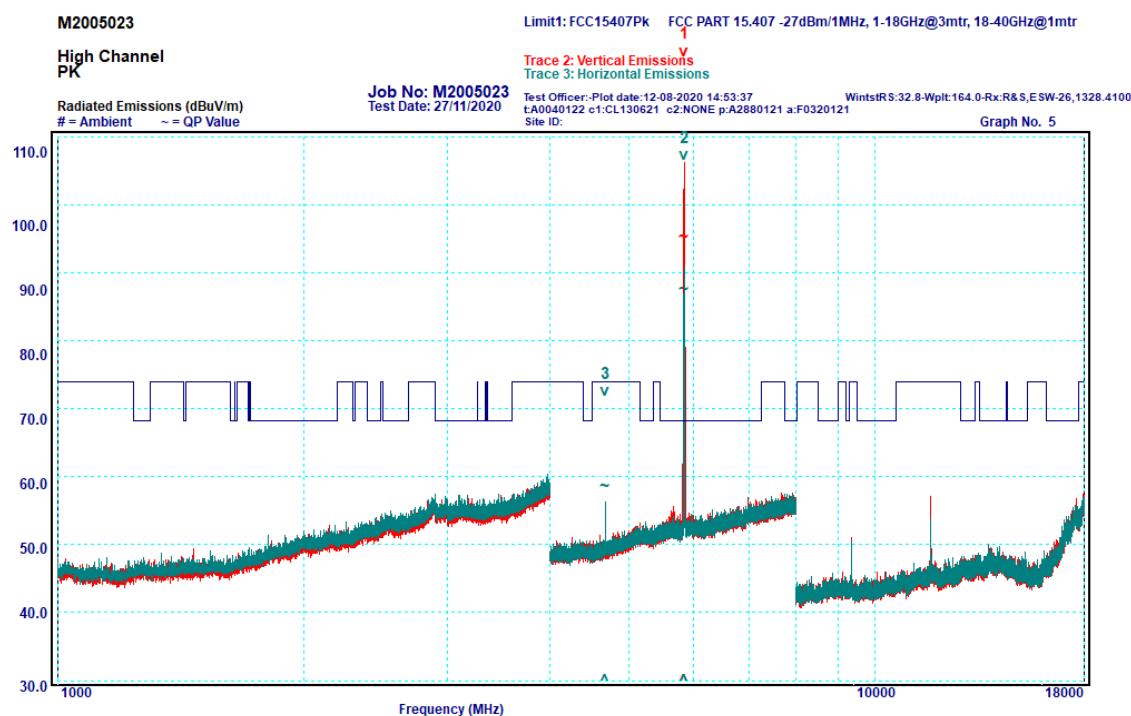
| Peak | Frequency [MHz] | Polarisation | Peak                 |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1*   | 5734            | Vertical     | N/A                  | N/A                  | N/A         |
| 2*   | 5766.35         | Vertical     | N/A                  | N/A                  | N/A         |
| 3*   | 5816.36         | Vertical     | N/A                  | N/A                  | N/A         |
| 4    | 17674.62        | Horizontal   | 56.5                 | 68.2                 | -11.7       |

\*Peaks 1, 2 and 3 are measurements on the fundamental transmission and are not subject to the spurious emissions limit of the standard.



Graph 6-23: Transmitter Spurious Emissions, 1 – 18 GHz, Mid Channel, Peak

\*Peak above the limit is the fundamental transmission and is not subject to the spurious emissions limit of the standard.



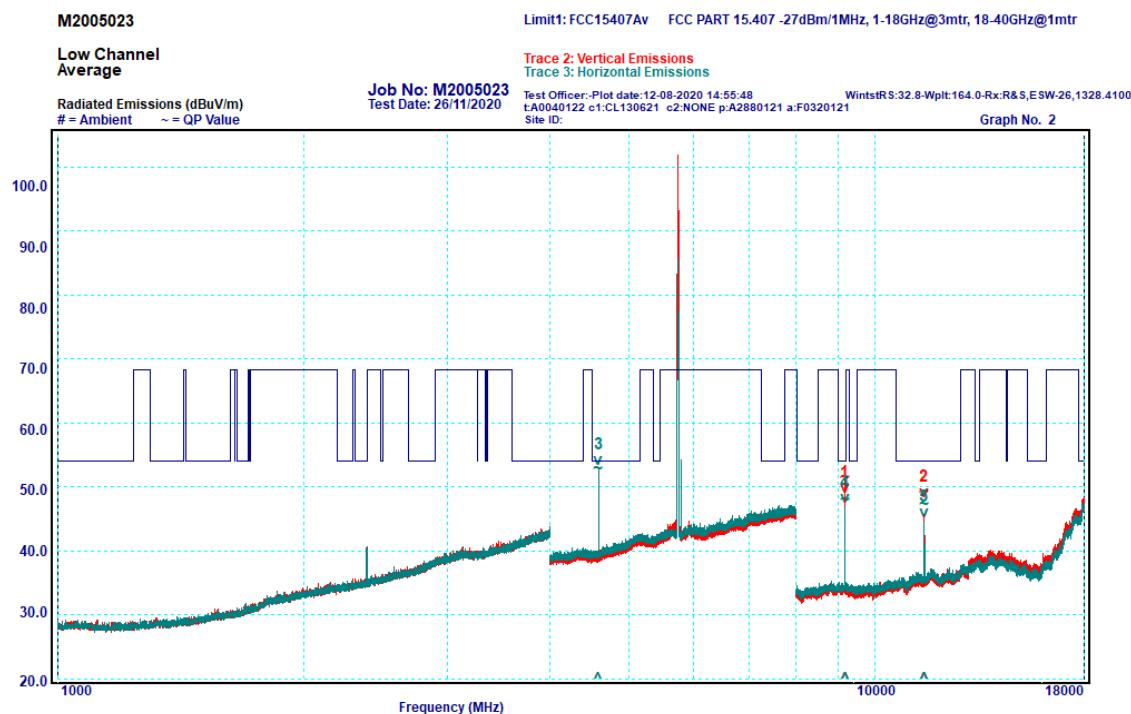
Graph 6-24: Transmitter Spurious Emissions, 1 – 18 GHz, High Channel, Peak

Table 6-12: Transmitter Spurious Emissions, 1 – 18 GHz, High Channel, Peak

| Peak | Frequency [MHz] | Polarisation | Peak                 |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1*   | 5841.53         | Vertical     | N/A                  | N/A                  | N/A         |
| 2*   | 5842.3          | Vertical     | N/A                  | N/A                  | N/A         |
| 3    | 4672.77         | Horizontal   | 58.5                 | 74                   | -15.5       |

\*Peaks 1 and 2 are measurements on the fundamental transmission and are not subject to the spurious emissions limit of the standard.

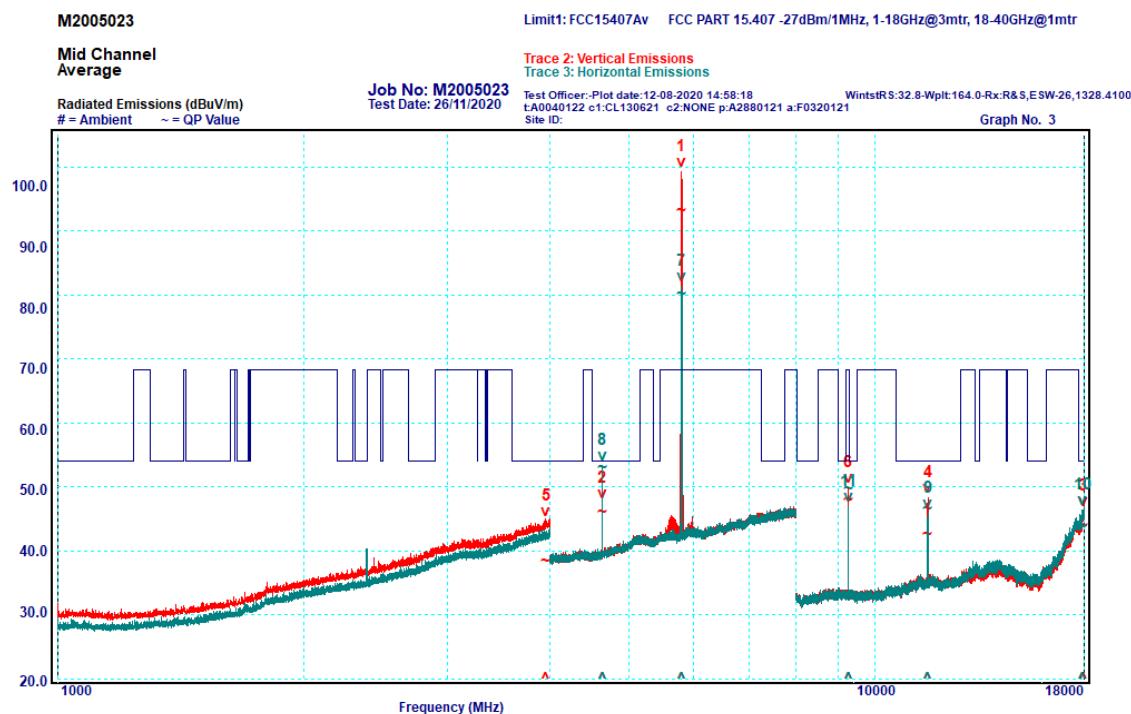
### Average Measurements:



Graph 6-25: Transmitter Spurious Emissions, 1 – 18 GHz, Low Channel, Average

Table 6-13: Transmitter Spurious Emissions, 1 – 18 GHz, Low Channel, Average

| Peak | Frequency [MHz] | Polarisation | Avg                  |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1    | 9175            | Vertical     | 51.5                 | 54                   | -2.5        |
| 2    | 11472.11        | Vertical     | 49.1                 | 54                   | -4.9        |
| 3    | 4587.49         | Horizontal   | 52.8                 | 54                   | -1.2        |
| 4    | 9175.01         | Horizontal   | 48                   | 54                   | -6          |
| 5    | 11472           | Horizontal   | 47.3                 | 54                   | -6.7        |

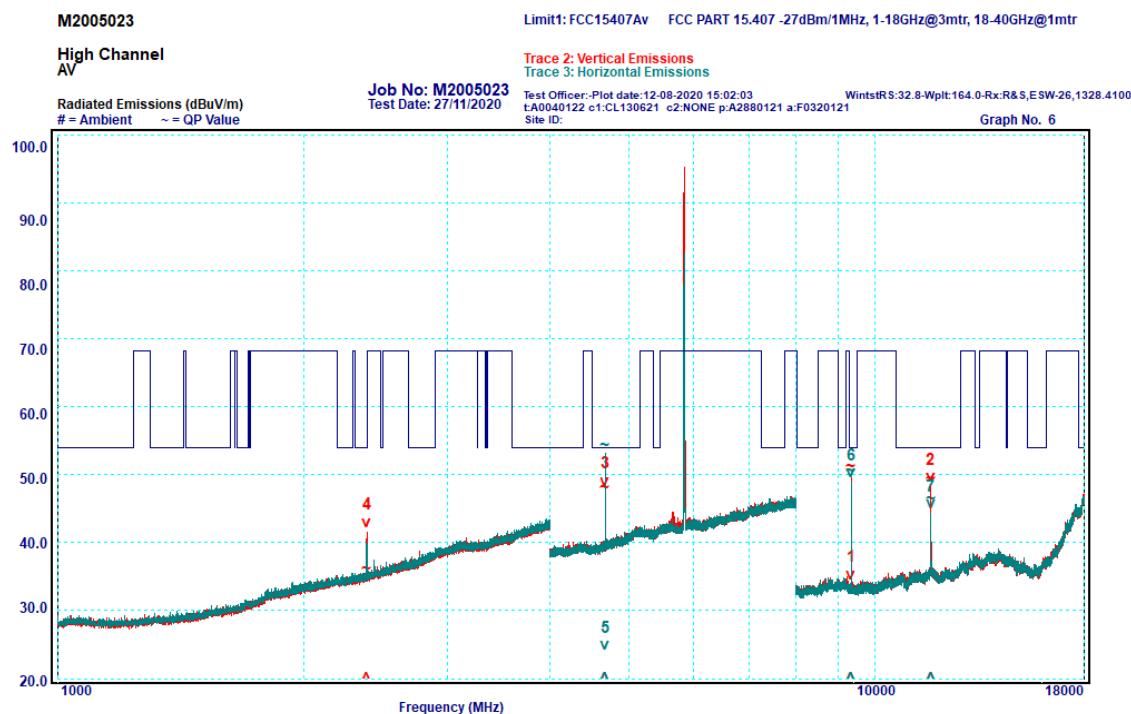


Graph 6-26: Transmitter Spurious Emissions, 1 – 18 GHz, Mid Channel, Average

Table 6-14: Transmitter Spurious Emissions, 1 – 18 GHz, Mid Channel, Average

| Peak | Frequency [MHz] | Polarisation | Avg                  |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1*   | 5794.63         | Vertical     | N/A                  | N/A                  | N/A         |
| 2    | 4636.17         | Vertical     | 46                   | 54                   | -8          |
| 3    | 17950.94        | Vertical     | 43.9                 | 54                   | -10.1       |
| 4    | 11594.16        | Vertical     | 42.5                 | 54                   | -11.5       |
| 5    | 3957.75         | Vertical     | 38.4                 | 54                   | -15.6       |
| 6    | 9272.51         | Vertical     | 47.9                 | 68.2                 | -20.3       |
| 7*   | 5794.69         | Horizontal   | N/A                  | N/A                  | N/A         |
| 8    | 4636.26         | Horizontal   | 52.9                 | 54                   | -1.1        |
| 9    | 11593.15        | Horizontal   | 46.6                 | 54                   | -7.4        |
| 10   | 17928.28        | Horizontal   | 43.7                 | 54                   | -10.3       |
| 11   | 9272.49         | Horizontal   | 49.6                 | 68.2                 | -18.6       |

\*Peaks 1 and 7 are the fundamental transmissions and are not subject to the spurious emissions limit of the standard.



Graph 6-27: Transmitter Spurious Emissions, 1 – 18 GHz, High Channel, Average

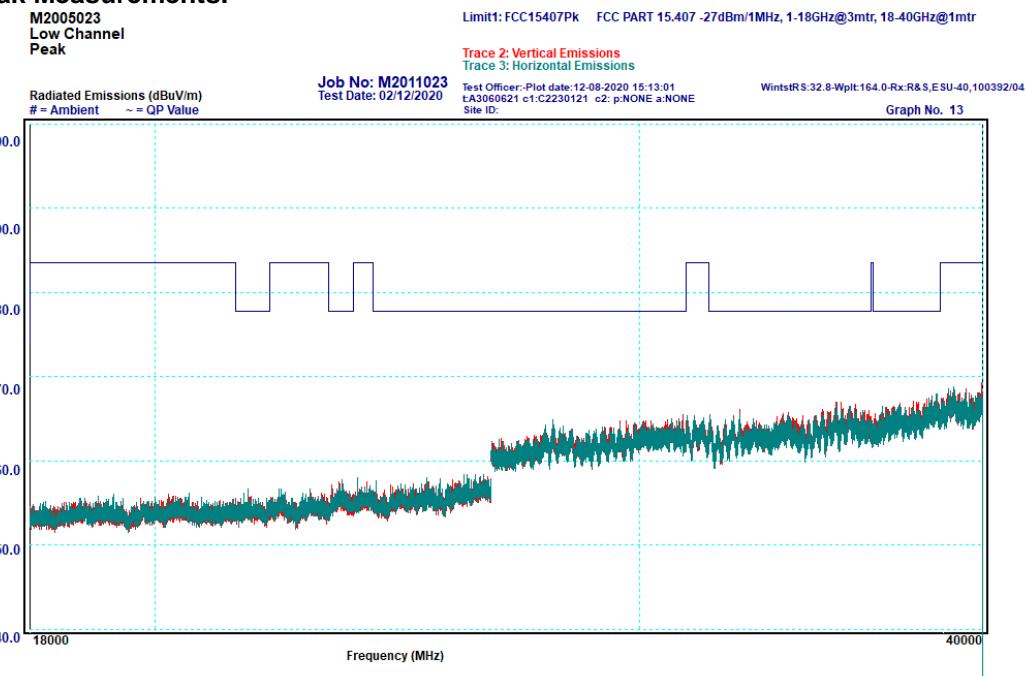
Table 6-15: Transmitter Spurious Emissions, 1 – 18 GHz, High Channel, Average

| Peak | Frequency [MHz] | Polarisation | Avg                  |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1    | 9345.63         | Vertical     | 51.2                 | 54                   | -2.8        |
| 2    | 11684.51        | Vertical     | 49.5                 | 54                   | -4.5        |
| 3    | 4672.82         | Vertical     | 48                   | 54                   | -6          |
| 4    | 2390.71         | Vertical     | 36.1                 | 68.2                 | -32.1       |
| 5    | 4672.82         | Horizontal   | 53.7                 | 54                   | -0.3        |
| 6    | 9345.64         | Horizontal   | 50.5                 | 54                   | -3.5        |
| 7    | 11684.29        | Horizontal   | 46.4                 | 54                   | -7.6        |

### 6.9.6 Transmitter Spurious Emissions: 18 - 26 GHz

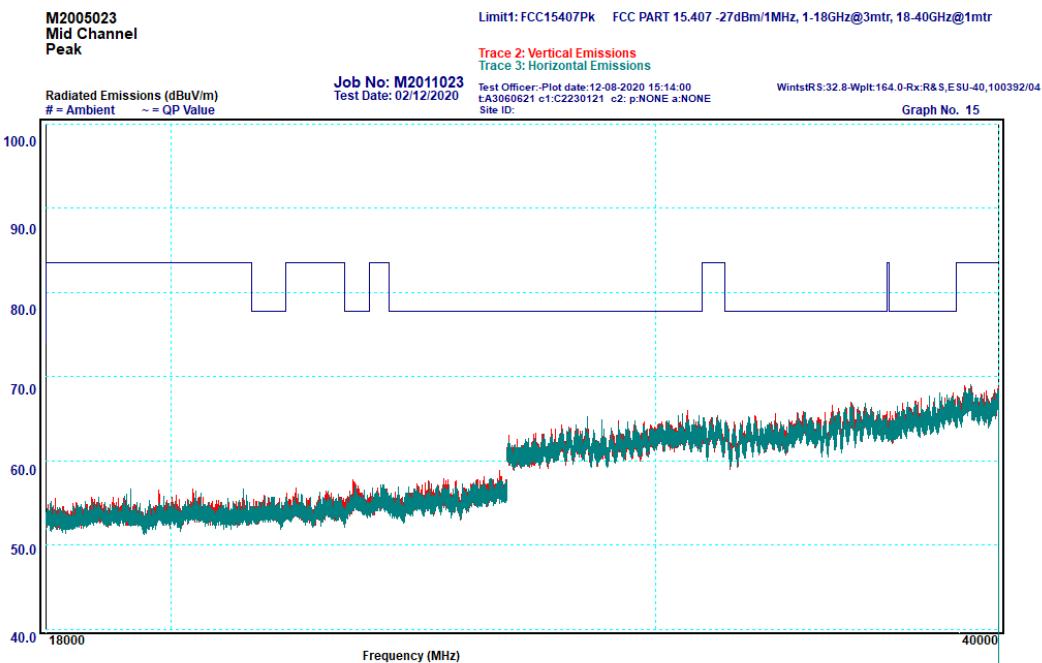
All emissions measured in the frequency band 18 – 26 GHz complied with the requirements of the standard.

#### Peak Measurements:



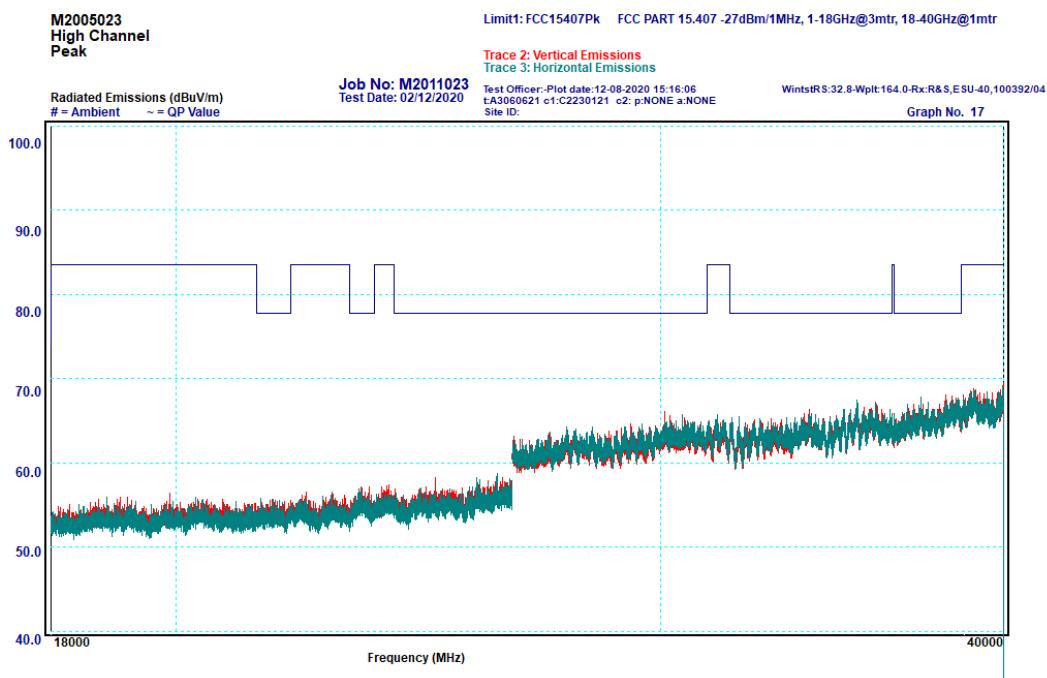
Graph 6-28: Transmitter Spurious Emissions, 18 – 40 GHz, Low Channel, Peak

No peaks were measured within 10 dB of the limit.



Graph 6-29: Transmitter Spurious Emissions, 18 – 40 GHz, Mid Channel, Peak

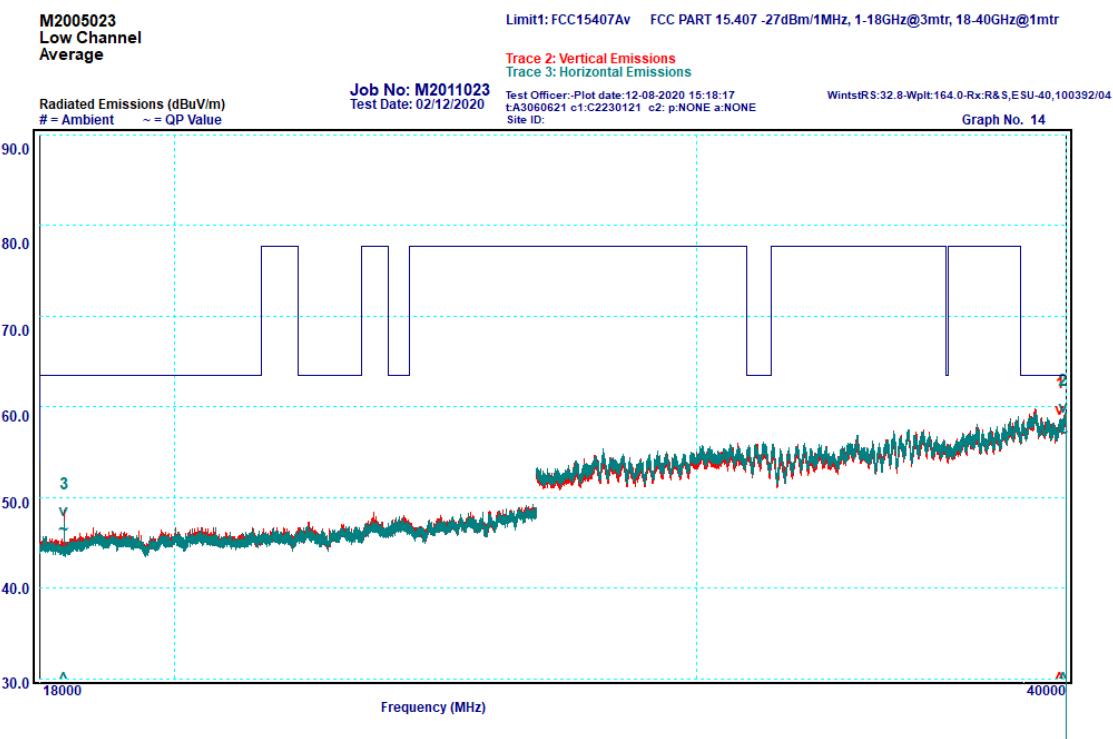
No peaks were measured within 10 dB of the limit.



Graph 6-30: Transmitter Spurious Emissions, 18 – 40 GHz, High Channel, Peak

No peaks were measured within 10 dB of the limit.

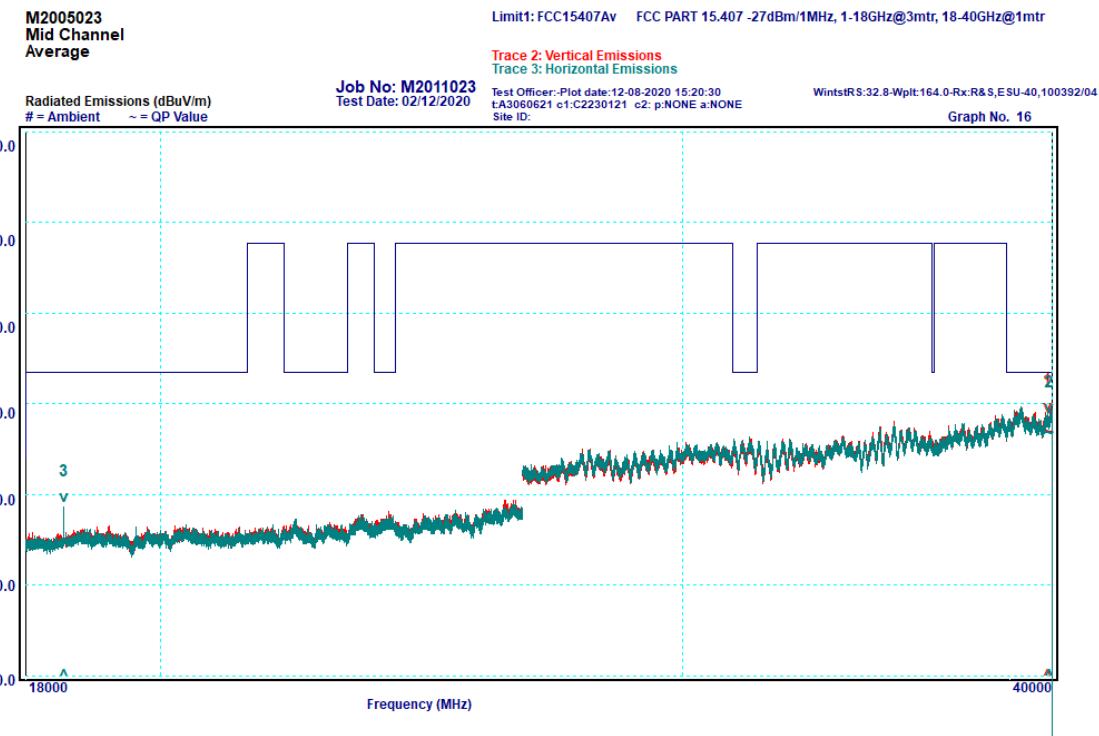
### Average Measurements:



Graph 6-31: Transmitter Spurious Emissions, 18 – 40 GHz, Low Channel, Average

Table 6-16: Transmitter Spurious Emissions, 18 – 40 GHz, Low Channel, Average

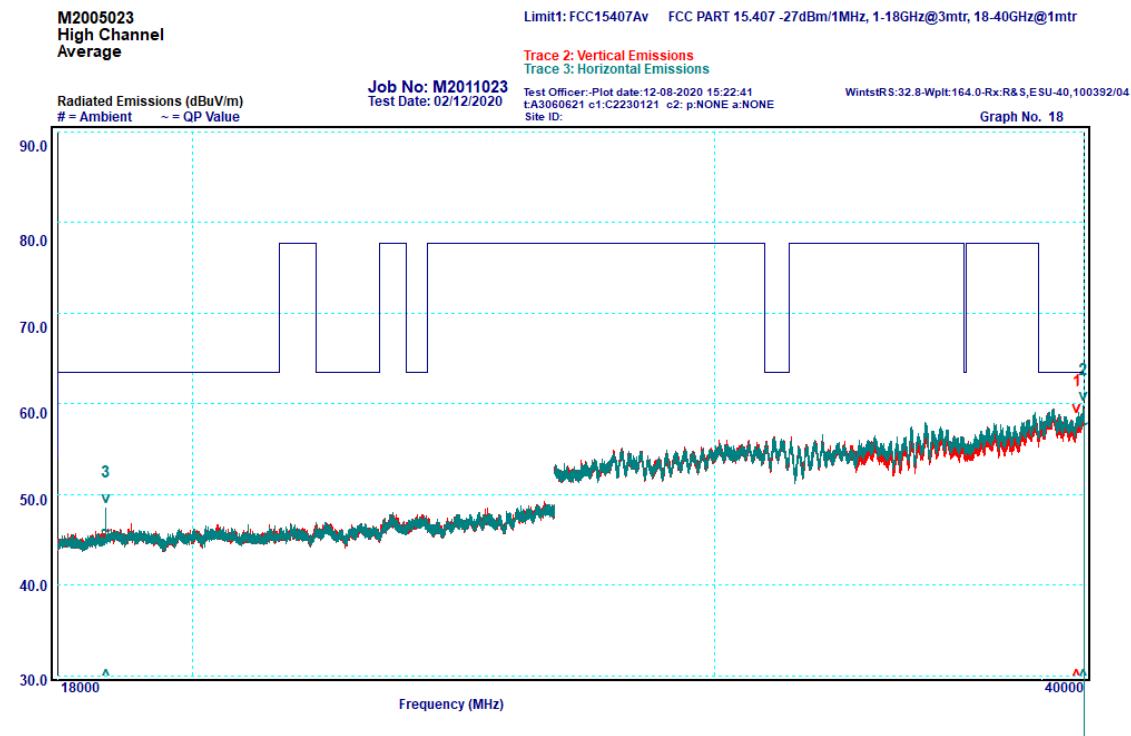
| Peak | Frequency [MHz] | Polarisation | Avg                  |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1    | 39809.51        | Vertical     | 57.4                 | 63.5                 | -6.1        |
| 2    | 39909.92        | Horizontal   | 57.1                 | 63.5                 | -6.4        |
| 3    | 18350.09        | Horizontal   | 46.4                 | 63.5                 | -17.1       |



Graph 6-32: Transmitter Spurious Emissions, 18 – 40 GHz, Mid Channel, Average

Table 6-17: Transmitter Spurious Emissions, 18 – 40 GHz, Mid Channel, Average

| Peak | Frequency [MHz] | Polarisation | Avg                  |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1    | 39875.91        | Vertical     | 56.8                 | 63.5                 | -6.7        |
| 2    | 39900           | Horizontal   | 56.8                 | 63.5                 | -6.7        |
| 3    | 18545.13        | Horizontal   | 44.7                 | 63.5                 | -18.8       |



Graph 6-33: Transmitter Spurious Emissions, 18 – 40 GHz, High Channel, Average

Table 6-18: Transmitter Spurious Emissions, 18 – 40 GHz, High Channel, Average

| Peak | Frequency [MHz] | Polarisation | Avg                  |                      |             |
|------|-----------------|--------------|----------------------|----------------------|-------------|
|      |                 |              | Level [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
| 1    | 39774.59        | Vertical     | 56.8                 | 63.5                 | -6.7        |
| 2    | 39962.7         | Horizontal   | 57.7                 | 63.5                 | -5.8        |
| 3    | 18691.28        | Horizontal   | 45.9                 | 63.5                 | -17.6       |

## 6.10 §15.407(f) / §RSS-102 Maximum Permissible Exposure

The EUT complied with the applicable maximum permissible exposure levels. Refer to EMC Technologies report M2005023-5 & M2005023-6.

## 6.11 §15.215/ §RSS-Gen 6.7 Occupied Bandwidth – 99% power

### 6.11.1 Test procedure

The bandwidth containing 99% power of the transmitted signal was measured using the procedure from ANSI C63.10 section 6.9.

### 6.11.2 Limits

The 99% power should be contained within the frequency band 5725 – 5825 MHz.

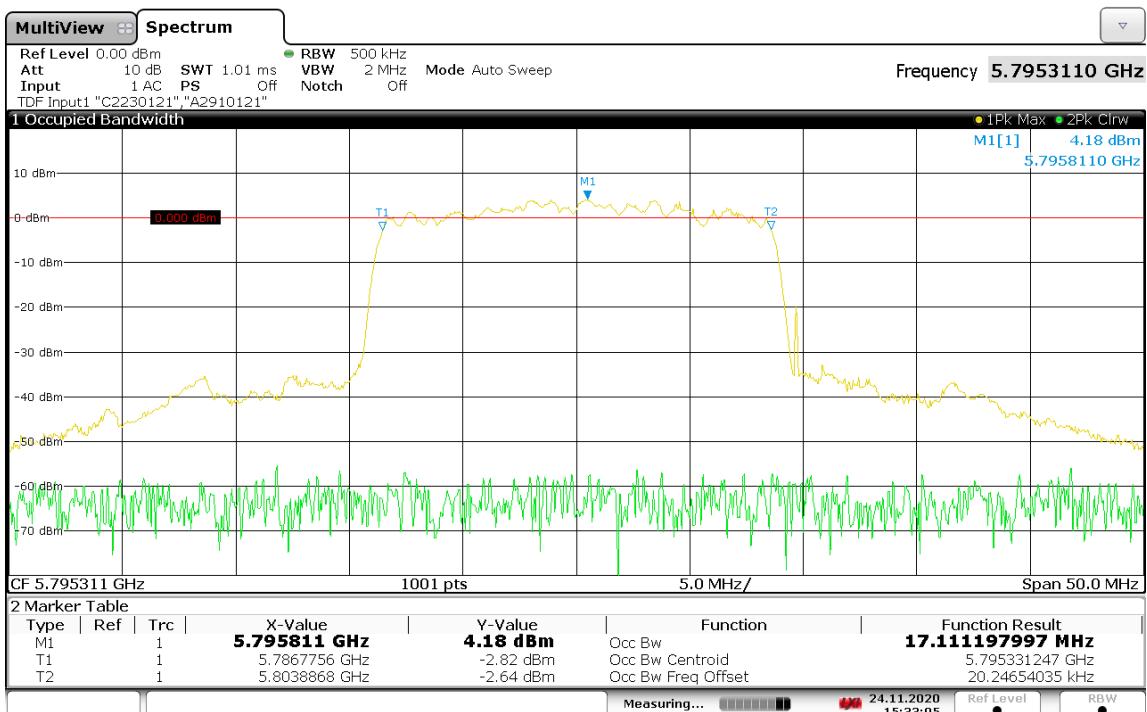
### 6.11.3 Results

Table 6-19: Occupied Bandwidth

| Freq. [MHz] | 99% Bandwidth [MHz] | Low Frequency [MHz] | High Frequency [MHz] | Result   |
|-------------|---------------------|---------------------|----------------------|----------|
| 5734.375    | 17.10               | 5725.83             | 5742.93              | Complied |
| 5795.311    | 17.11               | 5786.77             | 5803.88              | Complied |
| 5841.013    | 17.10               | 5832.47             | 5849.58              | Complied |



Graph 6-34: Occupied bandwidth, Low Channel



Graph 6-35: Occupied bandwidth, Mid Channel



Graph 6-36: Occupied bandwidth, High Channel

**END OF REPORT**